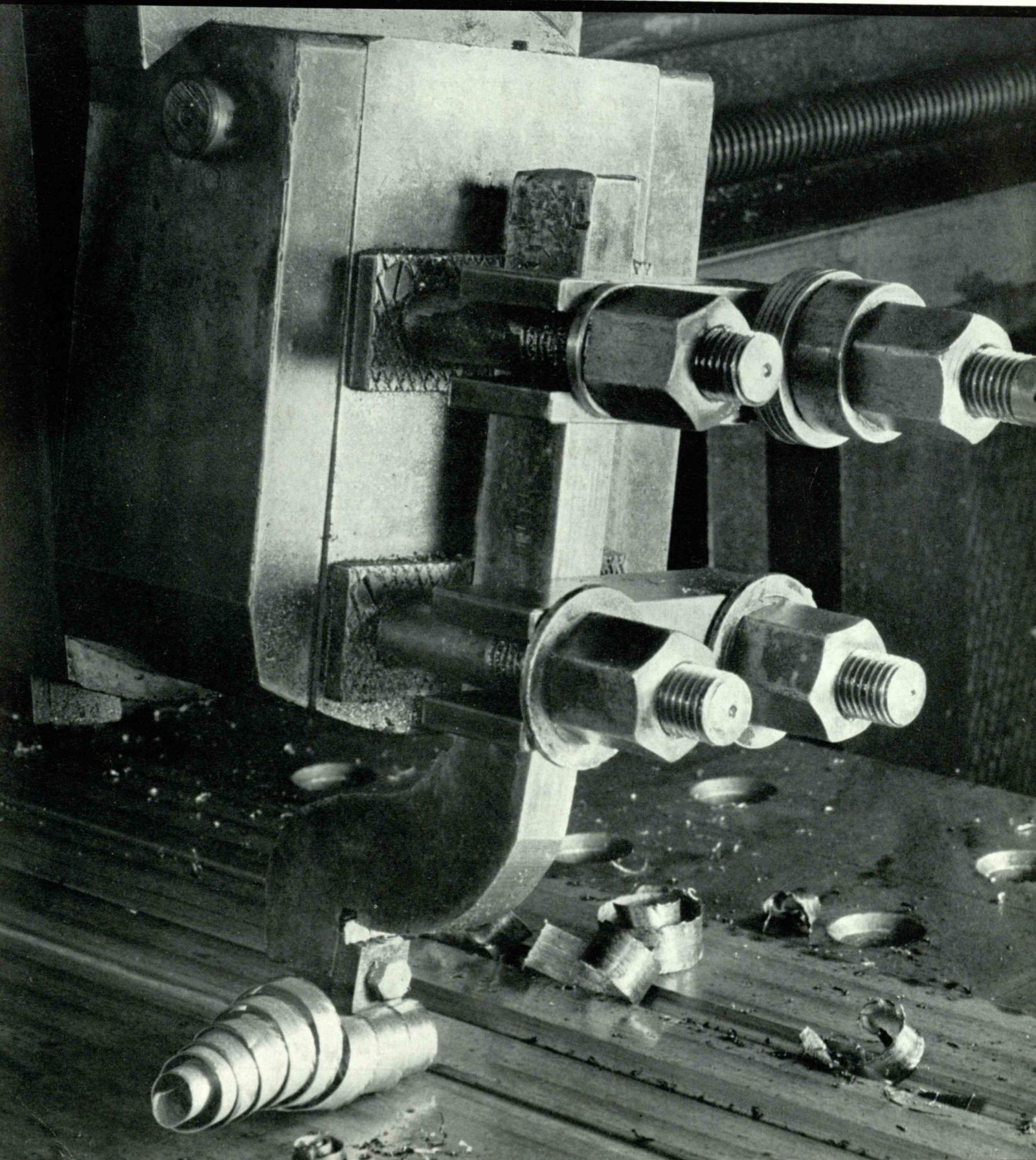


May 1940

TECHNOLOGY REVIEW

Title Reg. in U. S. Pat. Office



technology review

Published by MIT

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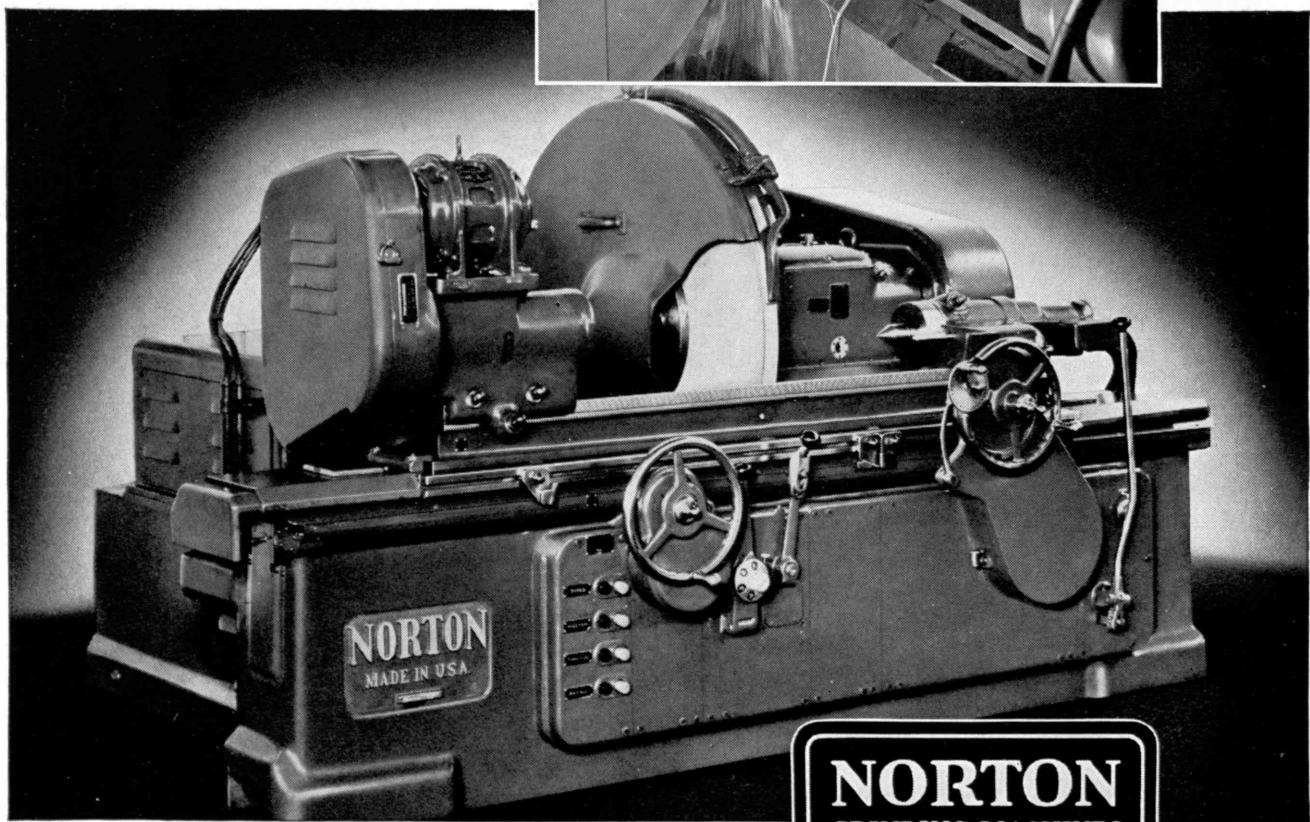
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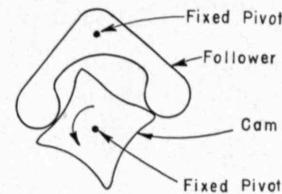
THE TABULAR VIEW

HOUSING the millions of Americans who at present are sheltered in unsanitary and wasteful slums, and whose economic status is such that careful planning is essential if the task of sheltering them is to be done without either overstraining the economic fabric or unjustly handicapping other income groups, is a problem of much social and governmental concern. Conditions which must be met if it is to be settled are penetratingly analyzed in this issue of *The Review* (page 276) by WALTER R. MACCORNACK, '03, Dean of the School of Architecture, who writes with the authority of long and responsible connection with housing questions. In 1932, Dean MacCornack was a member of the committee on large-scale housing of President Hoover's Conference on Home Building and Home Ownership; for three years, 1936 through 1938, he was chairman of the housing committee of the American Institute of Architects; as vice-president of that organization, he now directs its housing activities. Cleveland Homes, Inc., a public works slum-clearance program, is a notable example of the work in housing to which he was principally devoted in the decade prior to his return to Technology as dean in 1939. ¶ The lethal use to which explosives are being put in wider and wider parts of the world may obscure the fact that they can be the source of much fun. With this latter aspect TENNEY L. DAVIS, '13, Professor of Organic Chemistry at Technology and Editorial Associate of *The Review*, is concerned in an article (page 273) which bespeaks anticipation of the now nearing Glorious Fourth. Historian of science, as well as commentator on bombs, Professor Davis in this article brings two of his manifold interests into conjunction. ¶ Third in a series of surveys which this volume of *The Review* has contained on some of the broad research programs under way at Technology is the résumé of investigations and applications in the field of ultrahigh frequency which EDWARD L. BOWLES, '22, Professor of Electrical Communications, presents in this issue (page 279). As director of the Round Hill Experiment Station, history of which he recounted in *The Review* for October, 1934, and as leader of the group which developed the Civil Aeronautics Authority-Massachusetts Institute of Technology blind-landing system for airplanes, Professor Bowles has been in close touch with all phases of the high-frequency program. ¶ Just what lubrication is expected to do depends upon just what friction is, and upon this relation depends no small amount of research and study. The intricacies of what goes on at the boundary where two moving surfaces impinge on each other are discussed (page 282) by JOHN WULFF, Associate Professor of Physical Metallurgy at the Institute and fourth author provided for this issue by the Faculty. Dr. Wulff's earlier contributions to *The Review*, in December, 1938, and April, 1939, have dealt with the development of the techniques of powder metallurgy and with research into the exceedingly costly problems of corrosion, studies which also are concerned with surface phenomena.

No. 25

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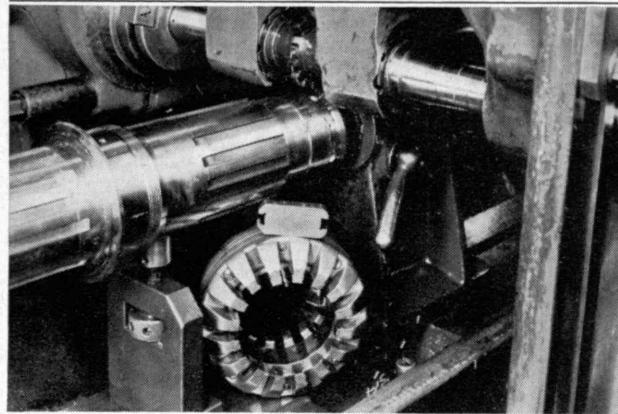
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MAIL RETURNS

Celebration

FROM DAVID A. YOUNG:

. . . To your surprise, your letter must have traveled straight on without delay, because I received it direct from Panama on the fourteenth of January, just a month after it was written. Since the war we had a ship from New Zealand on the fifteenth of December land, then the *Remuera* from Panama on January 14, and now we are expecting one from New Zealand on the thirtieth inst., by which I am forwarding this note. . . . We celebrated the 150th anniversary of the *Bounty* yesterday, the twenty-third inst. . . . Best regards to all.

Pitcairn Island

Protest

FROM ROBERT N. ELLIOTT, JR., '38:

I wish to call your attention to what I consider a piece of gross negligence on the part of the editorial staff of The Review. In the February issue appeared an article titled "If War Comes." Surely none of the men on the staff of The Review is so naive as to think that war ever "comes." Such a carelessly worded title, if not purposely so worded, tends to create a fatalistic war psychology in its readers. If I remember the history that I learned back at Tech, every war we have ever fought, with the possible exception of the Revolutionary War, could have been avoided. In other words, war did not *come* to us. Instead, we went out looking for it.

If our government continues to meddle in the affairs of Europe, as it did by sending our Undersecretary of State to confer with officials of European governments, then history is likely to repeat itself, and we may find ourselves in another war because we went out looking for trouble.

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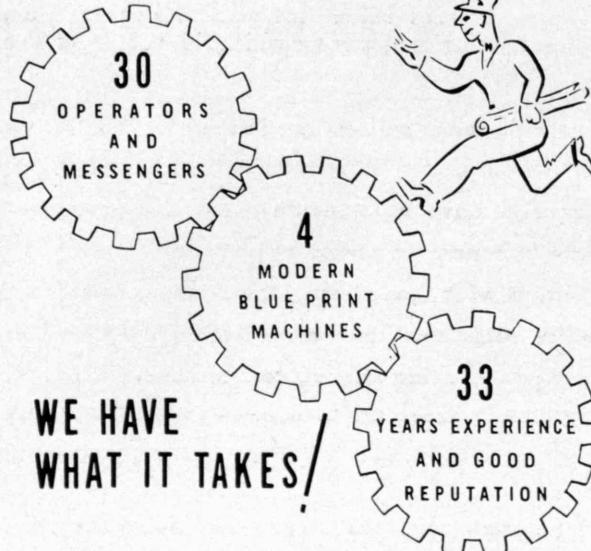
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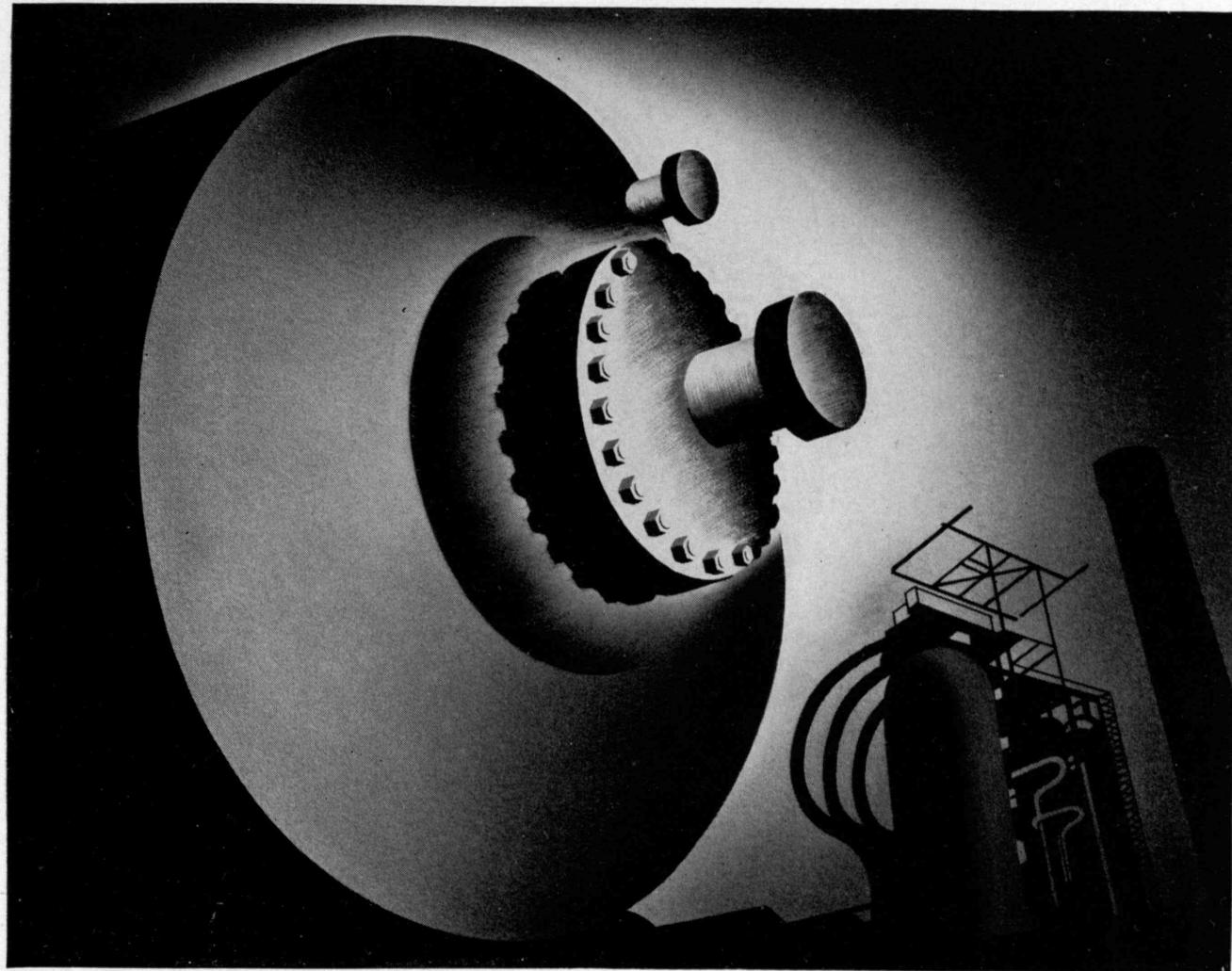
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THE TECHNOLOGY REVIEW

Title Reg. U. S. Pat. Office

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

VOL. 42, NO. 7

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From a photograph by John Skara

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John Skara

Angelfish

THE TECHNOLOGY REVIEW

Vol. 42, No. 7



May, 1940

The Trend of Affairs

Renaissance Engineers

WHEN the scientifically trained mind undertakes to write of a subject which may be characterized as spacious, when the mass of detail to be handled possesses many offshoots, when each compilation of data discloses new sets of facts to be assimilated somehow into the body of the story — the situation is one of potentially very good prose. Remaining as necessary to assure full realization of the potentiality is the sole condition that the work be unhurried in time and unconstricted in space — that the material be assembled and mastered deliberately, that it be marshaled and planned firmly and directly; that it be recounted with judicious fullness. Circumstances such as these give the scientist or engineer his best opportunity, for they bring into full play his training in system, in the orderly manipulation of blocks of material, in the effective linkage of part to part.

A perspective of some centuries fosters the full development of these values because, on the one hand, it permits detachment and objectivity about the factual material dealt with and, on the other hand, it makes for an attitude by the writer toward the men with whose work he is concerned which is at once reminiscent and sympathetic. There is perhaps greater impulsion to see full justice done when the event concerned is so remote in time that one can afford to pass by the irritating and the petty or, in sum, that one is enabled, for a little while at least, to assume the Olympian.

A remarkable volume* occasions this comment — a volume remarkable for the ease and the vividness with which it controls and reports a many-faceted story,

remarkable as well in that, essentially a labor of love, it was enabled to be a labor of leisure and care. A humble witness, though a very telling one, to this last conclusion may be had from the great number of excerpts from unpublished documents in which the Renaissance architects, engineers, burgesses, and great lords whose activities General Parsons recounts speak for themselves — in accents and terminology astoundingly consonant with analogous writings of our own time.

Naturally, Da Vinci and the multiple aspects of his strange genius fill a large share of even so large a book as this. In no other portion of the volume is the desirability of systematic and categorized treatment better demonstrated than in the chapters which General Parsons allocates to Da Vinci in his principal roles. So multifarious was Da Vinci's genius, and in their orientation so close to the attitude which rather arrogantly we like to appropriate as "modern" were his analyses and his practice, that the reader again and again must be brought up short by the almost inescapable realization of how essentially slight was the barrier of lacked knowledge preventing the tumultuous intellectual vigor of Da Vinci and his time from anticipating by centuries a large, if not the larger, share of the accomplishments for which we look to ourselves, our fathers, and grandfathers. What Leonardo and his age might have achieved — given control of steam and given the germ theory of diseases — is a speculation fraught with danger for the *amour-propre* of the Twentieth Century.

From the point of view of the student of social history, here is a wealth of isolated incidents any one of which is synoptic of the whole great drama of the gradual assertion of the royal authority and prestige despite the protestation and the struggle of feudalism. For instance, carts in 1184, passing by the palace of Philippe Auguste, stirred up mud which in turn emitted such a stench that

* William Barclay Parsons, *Engineers and Engineering in the Renaissance* (Baltimore: Williams & Wilkins Company, 1939) xix, 661 pages, \$8.00.



Pan Pacific Press

From mid-Pacific America comes this depiction of tropical shore line — along the Kona Coast of the island of Hawaii.

the monarch, nostrils outraged, convoked the burghers and the provost of Paris and ordered them to cause all the streets and public places of the city to be paved "with strong and hard stones." Then began a series of proclamations and ordinances, with a concomitant series of refusals to obey and stubborn persistences in neglect, which was to extend for four long centuries. What better measure of the impotence of the crown could be had than the exasperated inability of the king to keep his nobles from throwing filth into the very streets of the city, or a series of edicts extending over a century, endeavoring to prevent draymen from so crowding the streets with carts, coaches, wagons, vehicles, and timber that the ordinary passenger might progress only with difficulty. The parking problem evidently is no monopoly of the automobile. The hamstringing of engineering ability by vested interests, as in the toll system in which was entrenched the feudal seignior's domination over roads, is another powerful story in itself, which General Parsons tells directly and tersely, yet with all important detail. Current preoccupation with the rights and responsibilities of organizations of capital and of labor in the building of public works finds at least one archetype in his story of how the pavers of Paris so restricted their own trade that in the end they themselves were the chief sufferers.

Particularly interesting in a time which hopes that it is seeing the decline of the unfortunate compartmentalizing of constructive effort is the fact, explicitly stated now and then and implicit again and again, that fusion of aptitudes and expression in the Renaissance was by no means confined to Leonardo. Many of General Parsons' lesser figures were both engineer and architect, constructors of canals and bridges, designers of mills, workers in metal and stone. Of the several projects which offer illustration, that of the design and construction of the Rialto Bridge is, as presented in this volume, perhaps the best. All in all, this is a book to be approached with seriousness and with anticipation.

"The Good Earth"

NOTWITHSTANDING the great respect, bordering on reverence, which we have for the soil and the thriving, invisible world it harbors, apparently we are only beginning to realize its potentialities. The same soil that to the husbandman is a synthesizer of edibles, and to the average soil bacteriologist is the home of destructive micro-organisms, is to one prominent scientist a bountiful reservoir of potential protectors and savers of human life.

The scientist is René J. Dubos, a native of France, recently hailed by his colleagues as the modern Pasteur because of the tremendously significant program of research he is now carrying out at the Rockefeller Institute for Medical Research in New York. Dr. Dubos is the discoverer of a new method of producing bactericidal agents, which — reported in a number of technical papers during the past year — was first brought fully to the attention of the public last month, following its complete explanation by him at the congress of the American College of Physicians.

Dr. Dubos began his line of research nearly a decade ago, extending the already accepted notion that the soil contains micro-organisms that will "return to dust" all organic material that falls on it, whether an oak tree or a dead ant. He reasoned that in that organic melting pot might be found specific agents that would attack the bacteria of disease. He mixed a large number of soil samples gathered from different localities, baked the mixture at moderate temperatures to decompose most of the dead organic material, and then injected a sample of the specific bacteria for which he sought a killer. One of his early trials was with the Type III pneumococcus, cause of one of the most baffling and destructive types of pneumonia. After an appropriate waiting period, he analyzed the soil to find a bacillus whose enzyme dissolved the shell of the pneumococcus.

Then he started on the project that resulted in his announcements of the past year. Instead of a single bacterium, he inserted in his soil sample a potpourri, including pneumococci, streptococci, staphylococci—all representatives of the Gram-positive group of bacteria, named after the Danish scientist Hans Christian Joachim Gram, who indicated a significant division among bacteria on the basis of their ability, or lack of ability, to retain a certain violet dye. Analyzing his soil sample at the end of two years—during which time he had added more Gram-positive bacteria periodically—Dr. Dubos found a bacterium that was less selective in its bactericidal tendencies. He described it as a "Gram-positive, spore-bearing, aerobic bacillus, capable of lysing the living cells of many Gram-positive microbial species." In fact all Gram-positive species thus far tested are killed, many of them dissolved, by the exudates of this one bacillus.

Further study revealed that a fractionation of the agent released by the bacillus and soluble in alcohol, acetone, and dioxane, but not in water, was the true bactericidal agent, and that it was fifty to one hundred times as active as the original extract. When tried on mice, a single milligram was sufficient to ward off as many pneumococci as would normally kill ten thousand of those animals. On the basis of such tests, Dr. Dubos believes the agent, which he has named "gramicidin," to be more potent than any other yet described. Once the bacillus was isolated, it was cultured in peptone until large amounts of its bactericidal enzyme could be extracted with the centrifuge. The agent is yet to be tried on man.

The formation of the bactericidal agent in the soil illustrates a new principle, according to Dr. Dubos—"the adaptive production of enzymes by bacteria." In

other words, it appears that a bacterium lacking the type of food to which the strain has been accustomed, may adapt itself, developing an enzyme that will digest whatever organic material happens to be present. Immediately we realize the further possibilities in this field: "On the basis of present knowledge," says Dr. Dubos, "it is conceivable that one may find in nature microbial species endowed with catalysts capable of activating almost any type of biochemical reaction." Again, he says that we have reason to hope "that one will eventually discover soil organisms capable of attacking other types of pathogens, such as the Gram-negative bacilli and the acid-fast bacteria. . . ." The latter are the pathogens of tuberculosis and leprosy. Already it is reported that research has been started at Harvard University to attack the tubercle bacillus by Dr. Dubos' technique.

Units of Measure

ONE of the many effects of swift methods of modern communication and transportation has been to put us in the embarrassing position of having a preponderance of outmoded units of measure on our hands, without any ready means of cleaning house. When countries, and even localities, were segregated, a variety of units of measure was no drawback. But now we have reached a dilemma in our weights and measures which is fully as baffling as the traffic problem in a city that has grown up around the proverbial cow paths. Our measures are so deeply entrenched in our culture and in our everyday implements, even in our geographical situation, that it will require enormous effort to bring about a change. And yet many of these antiques of measurement are entirely unsuited to the demands of national and

From Northeastern America, this recollection of history, in the officers' quarters of Fort Anne, Annapolis Royal, Nova Scotia. Fort Anne—construction of which was begun by the French in 1605—was surrendered to the British in 1710. Most of the inner buildings and the original gateway have disappeared, but otherwise it stands as originally built. The building here shown was erected by order of the Duke of Kent, Queen Victoria's father, in 1797, when he was commander of the British forces of North America. Used as the officers' quarters until the removal of the garrison to Halifax in 1854, it has since housed a museum of objects connected with the history of Nova Scotia.



C. H. R. Mable



Shigeta-Wright

Jackhammer ticktackoe during resurfacing of the upper level of the Michigan Avenue Bridge in Chicago

international exchange — whether the exchange be civil, economic, or scientific — in our highly technical and closely integrated society.

Any doubts as to the complications that exist among our present measuring units are readily dispelled when we read in *Compressed Air Magazine* an article summarizing the ancient origins of our units. The foot came from the length of the king's foot; the old cubit was the length of a forearm; the grain came from the weight of a single grain of wheat "well dried from the middle of the ear"; and the inch originated as the thickness of a man's thumb. Traditionally the acre was the area of ground that a plowman with one ox could turn over in a day.

Often, neighboring countries assigned slightly different lengths to the same unit, such as the foot — which might equal any length from 11.3 to 14 inches. The Greeks even recognized three different feet, which were used for three different purposes. In pre-Elizabethan England, the gallon depended upon the usage, that for wine being considerably smaller than the standard for ale.

Many of these idiosyncrasies have been retained even to this day. With avoirdupois and troy we have two systems of weight, and we have dry and fluid measures of volume. We have long and short tons and long and short cords, a hundredweight which weighs 100 pounds and a long hundredweight at 112 pounds. The height of horses is measured in hands and their weight in stones; and we measure paper by the ream, which may be 480 or 500 sheets. In this country a billion is a thousand million, whereas to the English it is a million million. Seamen cling to their nautical miles, knots, and fathoms.

Although modern usage has brought about the standardization of nearly all of these units, the reference standard is seldom easily found and the conversion

factors between units constitute a complexity in themselves. Such factors as 12, 3, 8, 16, 640, 5,280, 1,760, 160, 2,000, 2, and 4 waste our time daily and try our patience, to say nothing of introducing errors in our calculations. What a comfort it would be to have done with these relics and adopt a system in which 10 and 100 were the keys to conversion. Not that there is anything mystical about 10, but it is the essence of our universally adopted numbering system; the 12-inch foot would be entirely appropriate in a culture

whose system of numeration employed 12 as its base.

It is to be hoped that some means may be found to lessen the human resistance and temporary inconvenience which would accompany the adoption of the metric system in its entirety. For there will be resistance and inconvenience. Witness the recent case of the millibar, in which too soon we hailed the displacement of the mercurial standard in barometric pressures (see *The Review*, February, page 143). During the first month of the millibar's regime, public disapproval was so severe that the United States Weather Bureau found compromise advisable, indicating pressures in both inches and millibars on its maps. The resentment arose not only from the fact that the mind naturally rebels against the upsetting of a tradition but also because thousands of barometers, good for another lifetime of service, are calibrated in inches.

From this single example we can imagine the resistance and friction that will accompany attempts to relegated to antiquity those units of measure that are even more closely associated with our daily routine, even more a part of our tradition. Our homes and places of business are now well equipped with rules, yardsticks, tapes, cups, measuring spoons, thermometers, barometers, micrometers, speedometers, thermostats, gauges, meters, and gasoline pumps. Tools, fixtures, drawings, maps, containers, even cookbooks, are also involved. The constant desire for greater precision has led to permanency and expensiveness, until these measuring instruments now represent a long-range investment of millions of dollars.

Our established system of land measure presents its own unique problem, since the sizes of our townships, counties, and states are based largely on the acre and the square mile. Should we have to resurvey this country

on the basis of the hectare (100 acres, each 100 square meters), or should we recompute the existing areas at the rate of 0.4047 hectare to the acre?

But would not the eventual gain be worth the price and the temporary inconvenience? Quite likely it would, just as it may be more economical to buy a new automobile than to support the old one with its inefficiencies and inconveniences. Yet it is well to recognize the full scope of the dilemma and to understand that the transition is far from being as simple as switching to a new brand of food.

The Wherewithal

MONEY talks, but people talk about money — or at least about their share of it — ordinarily only when persuaded by the government or by some equally potent authority. Nevertheless, considerable data on what people earn do come to light. Random reading among recent statistics yields the information that in 1936 the average earnings of an American employee amounted to \$1,244. In that same year college graduates (male) only a year in possession of their diplomas had averaged \$1,300, and the analysis by the United States Office of Education — which had disclosed this fact — also pointed out that girl graduates a year out of college had averaged about \$1,100.

Men who had been out of college eight years in 1936, however, were getting \$2,400 apiece, while their women colleagues could average only \$1,600. This last sum was 33 per cent less than that obtained by the men, and it is interesting that when the same calculation is carried out for workers in trades employing large numbers of women (such as textiles, clothing, and confectionery), the results show women workers to get about 36 per cent less an hour than the men. These are rough comparisons, of course; the averages are based on varying and sometimes limited numbers of returns, and the data were obtained at different times.

For those college alumni who had spent eight years struggling for a living and whose status was known to the Office of Education, it appears that engineering and research paid about as well as general business — that is, about \$2,500 a year — but not so well by a matter of \$500 as medicine or the law. A previous and unusually comprehensive survey confined only

to engineers and made by the Bureau of Labor Statistics shows that in 1929 — a year when 6.4 per cent of all incomes in the country exceeded \$4,000 — graduate engineers with ten years' experience obtained from \$3,600 to \$4,600 in the various branches of their profession, and that the median income for all engineers was \$3,400. By 1934, however, this median income had shrunk to \$2,300. Although this shrinkage represents a drop in "real" income also, the latter drop was considerably smaller than indicated by the foregoing figures, since prices had fallen too.

As is the habit of statistics, these figures give an exceedingly terse summary of the actual situation. They hide the many who struggle on the fringes of the professions and do no better, and sometimes worse, than skilled workmen. They also hide the not so many who, by the grace of the Securities Exchange Commission and the United States Treasury, must make a front-page story for the newspapers every time an official list of high salaries is published. The latest one indicates that, in 1938 or in fiscal years ending in 1939, about four hundred people received compensation for personal services (not total income) exceeding \$75,000.

Nowhere on the list could be found the name of Seabiscuit, who, for his five earning years, has been averaging \$87,546 annually. And that ain't hay!

Smallpox Sanctuary

THE fourteenth of this month will mark the hundred and forty-fourth anniversary of Edward Jenner's first vaccination. It is nearly as long since Dr. Benjamin Waterhouse of Cambridge, Mass., introduced Jenner's methods to this country and started, on this side of the Atlantic, an intensive campaign against smallpox.



Line, curves, and angles in a stack of uncut gear blanks

Westinghouse



AH . . .

The beginning of a snuff-induced sneeze stroboscopically photographed by Marshall W. Jennison, '27, Assistant Professor of Sanitary Biology, in an investigation of the role of air-borne droplet nuclei in infection of air

Today the disease is nearly extinct in Europe, but here the dreams of Jenner and Waterhouse are still far from being realized, as the incidence of the scourge mounts annually. More than fifteen thousand cases were reported in 1938, according to the statistics of the Metropolitan Life Insurance Company; nearly twelve thousand cases were reported in 1937; and about seventy-eight hundred in 1936. These numbers are more impressive when compared with Europe's statistics: In 1936 — a representative year — there were 12 cases in England, 273 in France, none in Germany. The combined population of these three countries is about a hundred and fifty million; that of the United States, about a hundred and thirty million. The passiveness of Americans, only 55 per cent of whom have taken proper advantage of vaccination, is largely responsible.

To dwellers in the Eastern states, this intelligence may seem surprising, or even startling, because there the disease had almost been forgotten until a few minor outbreaks last summer appeared as reminders. Connecticut produced its first case in six years, and several outbreaks in New York gave that state its first scare in many seasons. Previously, New England, New York, Pennsylvania, New Jersey, Delaware, and Maryland had gone for one or two years at a time without a single case among their thirty-nine million people. We must go west to find smallpox taking a prominent place in the list of reportable diseases. The Mountain and Pacific states suffer the worst conditions. Apparently the strain of smallpox now infesting the United States is one of low virulence, causing the death of but few. Consequently there have been a lessening of respect for the hidden fangs of the pestilence and a decreasing use of vaccination.

After twenty years of specifically prohibited compulsory vaccination, during which an average of three thousand cases of nonvirulent smallpox annually had resulted in very few deaths, Minnesota learned a lesson: During a twenty-month period beginning in 1924, a

malignant form of the disease introduced from Canada — which, incidentally, has a smallpox rate about one-tenth the size of ours — brought more than five hundred deaths among about four thousand cases. Impressively, only seventy-two cases and one death occurred among those vaccinated during the previous seven years. Although the panic from that epidemic led to the vaccination of thousands and caused a drop to 225 in the annual incidence of the disease during the next decade, subsequent laxity is now causing the incidence of the nonvirulent form to increase steadily in that state. Today there are still three states specifically prohibiting compulsory vaccination.

In the Northwest a fear of imaginary dangers connected with vaccination still prevails. Although vaccine may have contained impurities in Jenner's time, it has since realized the benefit of more than a century of experiment and refinement. The point has been reached where attention is being given more to the elimination of vaccination scars and to reducing the slight indisposition which frequently follows this prophylactic treatment. A new and milder vaccine, cultured in chick embryo instead of the cow, is being studied. This gives some promise of reducing the minor discomfort and disfigurement caused by the traditional technique.

The best interval between vaccinations has been a matter for debate. Not many doctors will guarantee a vaccination for a period of more than ten years, and most of them recommend repetition of the treatment at least every five years. The New York State Board of Health goes farther, advising revaccination every three years, because such frequency usually averts indisposition.

Although India, with its estimated five hundred thousand cases annually, is the cesspool of the red scourge, the United States — currently regarded as the world's bulwark of peace, freedom, enlightenment, and progress — is still the disease's greatest sanctuary.

. . . CHOO!

Here the high-speed photographic technique perfected by Harold E. Edgerton, '27, Associate Professor of Electrical Measurements, vividly records the myriad droplets given off by the sneeze. Droplets may move as fast as 100 feet a second — a rate which in dry air would result in nearly instantaneous evaporation, producing nuclei of possibly infectious content.



Fireworks for Fun

Amusing Explosives Appeal to Something Deep Down in Human Nature

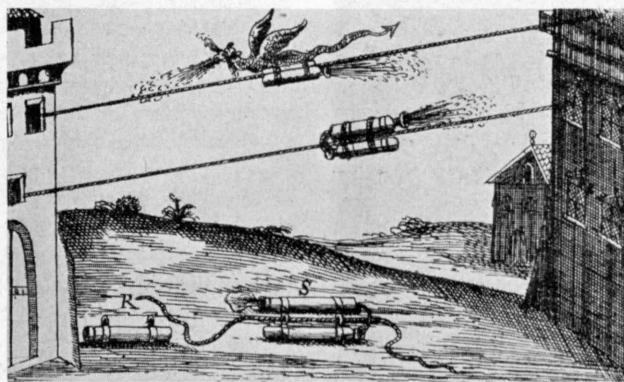
BY TENNEY L. DAVIS

FIREWORKS were before firearms. Pyrotechnic devices were in use for the pleasure that they gave before black powder had yet been put to service for throwing a projectile or for doing useful mechanical work. The spontaneous and long-drawn "ah-h-h!" and "oh-h-h!" which arise when a crowd of people is watching a display of rockets is evidence that fireworks appeal profoundly to something in us. Man in his innermost heart is still truly a fire worshiper.

Civilization surely commenced at the place where man first controlled a fire. Here pottery was made, ores were smelted, and metal objects were fashioned, better suited to human needs than is stone. Here social and political institutions arose, the storyteller and the minstrel exercised their magic, and here the medicine man practiced his primitive science. And from long-forgotten time an atavistic residue of religious feeling in the presence of visible combustion has survived in all of us. No man can be so old that he fails to recall the thrills of the pyrotechnic exhibitions which he witnessed as a boy nor so old that he will not experience them again and yearn for the fun of shooting off Roman candles and firecrackers.

Roger Bacon in the Thirteenth Century was probably the first man in North Europe to describe the preparation of gunpowder. He recommended it for the construction of petards, which, unhappily, he did not conceive to be devices for amusement. In the *Opus tertium* he says: "From the flashing and flaming of certain igneous mixtures and the terror inspired by their noise wonderful consequences ensue. As a simple example may be mentioned the noise and flame generated by the powder, known in divers places, composed of saltpeter, charcoal, and sulphur. When a quantity of the powder no bigger than a man's finger is wrapped up in a piece of parchment and ignited, it explodes with a blinding flash and a stunning noise. If a larger quantity is used, or if the case is made of some solid material, the explosion will, of course, be much more violent, and the flash and din altogether unbearable. . . ."

Marcus Graecus, probably a Byzantine of the Eighth Century and presumably much earlier than Bacon, described both rockets and crackers "for flying and for



Flying dragons according to Hanzelet Lorrain. These devices, now called flying pigeons, are at present manufactured after the same model.

making thunder": "Note that the envelope for flying ought to be thin and long, and well-filled with the powder tightly packed, while the envelope for making thunder ought to be short and thick, only half filled with powder, and tightly tied up at both ends with iron wire. Note that a small hole ought to be made in each envelope for the introduction of the match. The match ought to be thin at both ends, thick in the middle, and

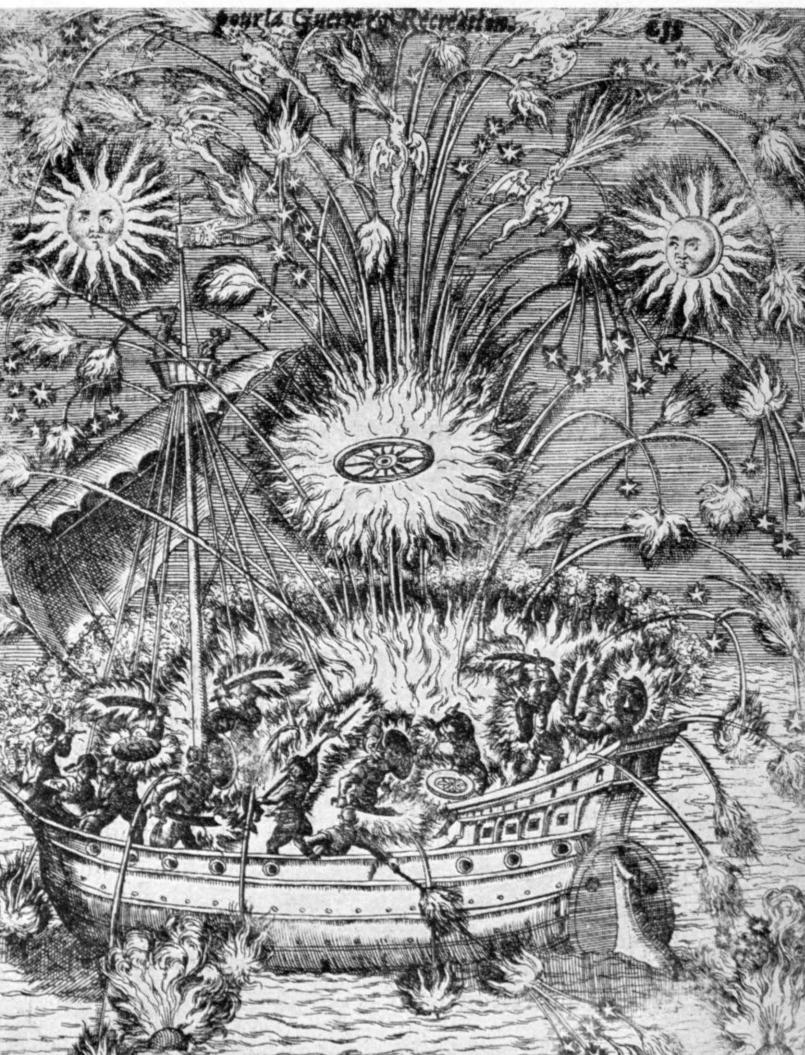
filled with the powder. The envelope intended to fly in the air has as many thicknesses as one pleases; that for making thunder however has a great many. . . . Another flying fire may be made from saltpeter, sulphur, and grapevine or willow charcoal. These materials, mixed and introduced into a papyrus tube, and ignited, will make it fly rapidly." The quotation is from *Liber ignium ad comburendos hostes* (Book of Fires for Burning the Enemy). Descendants of Greek fire, which was by no means intended for amusement, these are early forms of devices which we use for entertainment now. Stickless rockets, ignited and released from the hand, are still used in certain countries of Europe. It is considered to be funny to send them skittering among the crowd of carnival makers.

Although Roger Bacon had no knowledge of guns, he saw the possibility of getting useful and irrevocable mechanical work from his powder. In his letter *De nullitate magiae* he concealed the composition of the powder in an anagram but gave the reader an opportunity to check its solution by means of a problem in algebra, and concluded his account of it with the prophetic words: "Whoever will rewrite this, will have a key which opens and no man shuts: and when he will shut, no man opens." Interesting is the similarity of this passage to Revelations 3:7-8: "And to the angel of the church in Philadelphia write; These things saith he that is holy, he that is true, he that hath the key of David, he that openeth, and no man shutteth; and shutteth, and no man openeth; I know thy works: behold, I have set before thee an open door, and no man can shut it. . . ."

Practically all pyrotechnic compositions are derived from black powder, either by altering the proportions of its ingredients, by adding others, or by substituting

different substances for the saltpeter (potassium nitrate), the sulphur, and the charcoal. In his work on *The Mysteries of Nature and Art* (London, 1635), "The Second Booke Teaching most plainly, and withall most exactly, the composing of all manner of Fire-works for Tryumph and Recreation," John Bate says: "All kindes of gunpowder are made of these ingredients impasted, or incorporated with vinegar, or aquavitae, and afterwards grayned by art. The Saltpeter is the Soule, the Sulphur the Life, and the Coales the Body of it." This is correct, and it shows that John Bate really understood how gunpowder works. The saltpeter supplies oxygen for the combustion of the sulphur and the charcoal. The powder will burn under water — as well in the absence of air as in the presence of it. The best black powder for use in guns has been found to be that whose composition lies somewhere between the formula 75 parts of saltpeter, 12.5 parts of sulphur, and 12.5 parts of charcoal (6:1:1) and that using 75 parts of saltpeter, 10 parts of sulphur, and 15 parts of charcoal. By these two formulas, or by formulas intermediate between them, practically all the black powder for military and sporting purposes is made. Any considerable deviation from these proportions causes reduction in the strength of the

A fireworks display of the early Seventeenth Century, from La Pyrotechnie of Hanzelot Lorrain — flaming swords, shields, and pikes, wheel of fire, rockets, stars, candles, serpents, and water fireworks. The sun and the moon are probably aerial bombs, and the dragons are probably dragon rockets running on ropes but may be imaginative representations of serpents of fire. The picture shows that many of the fireworks which are now used for display purposes were already in use three centuries ago.



powder. The sulphur, as John Bate knew, serves to make the powder lively, to make it inflammable, and to make the fire quick spreading. The charcoal by its combustion largely produces the gas which causes the explosion. A typical blasting powder — which is slower than powder for guns — contains 62 per cent saltpeter, 20 per cent sulphur, and 18 per cent charcoal. A slow blasting powder contains the materials in the proportion 40:30:30.

At the beginning of the Seventeenth Century the art of pyrotechny had already attained a state of high development in France and England. Nearly all of the devices which are now in common use were made at that time — display rockets bursting with showers of stars, serpents, and crackers, aerial bombs and petards, Catherine wheels, fountains, water fireworks, flying pigeons, and grasshoppers (*saucissons* or English fire-crackers, as they used to be called). The design and the details of construction were essentially the same then as now. The fireworks were made by hand, as many fireworks are still made. Paper tubes and pasteboard cases are now rolled, glued, and cut by machinery, but the manufacture of fireworks remains an art which requires the utmost of dexterity and skill. Three hundred years ago rockets were made in wooden molds, on wooden spindles, with wooden rammers pounded by mallets. Steel tools, of the same form as the wooden ones, later came into use. In modern factories rockets are loaded by means of a hydraulic press. Rocket cases are no longer choked by hand crimping or constricting of the tubes but are choked by means of perforated clay plugs which are pressed into place. American flash crackers — the case, the fuse, loading, crimping, and so on — are manufactured completely by automatic machinery. The art of the pyrotechnist during the past three hundred years has changed about as much, and has undergone about the same kind of improvement, as has the art of the bookbinder during the same interval of time.

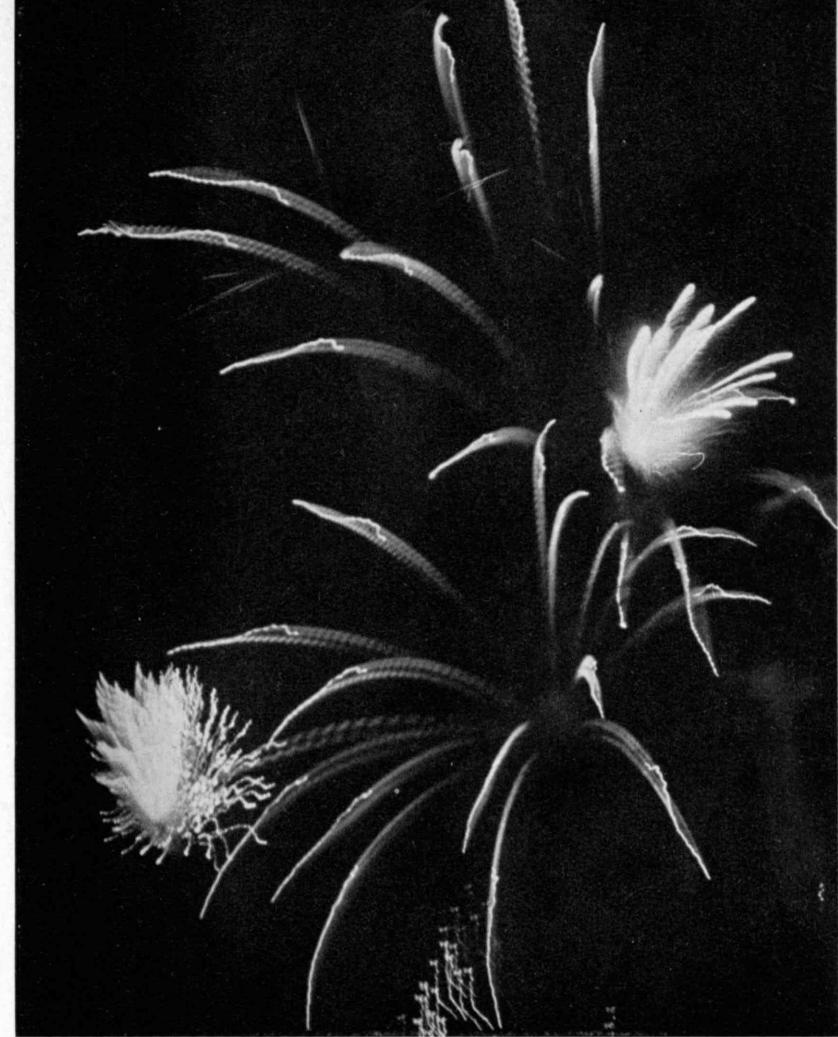
The advance of chemistry, however, has given the pyrotechnist new materials with which he can procure new and more brilliant effects: metallic salts for colors of all varieties, potassium chlorate to increase the vigor of combustion and to give sharper explosions, magnesium and aluminum for dazzling brightness. Chemistry has also supplied children's toy torpedoes, Pharaoh's serpents, black snakes, snakes in the grass, whistling crackers, sirens, and whizzers. The brilliancy, the variety, and the sharp detonations of a fine fireworks display are due to the development of chemical knowledge and are relatively new, but the form of the show is old, and the fundamental machinery of the performance is actuated by the same old materials.

In rockets the propelling charge is a mixture of the three ingredients of black powder in a proportion which makes them burn more slowly. They are not so finely powdered or so intimately mixed. Large rockets require a slower-burning propelling charge than do small ones. In a typical case, one- and two-ounce rockets are loaded with a mixture 36 parts of saltpeter, 6 parts of sulphur, 12 parts of coarse charcoal, and 7 parts of dust of willow charcoal, whereas eight-pound rockets are loaded with a mixture of 35 parts of saltpeter, 6 parts of sulphur,

13 of coarse charcoal, and 13 of dust of willow charcoal. The coarse charcoal produces the sparks which give the rocket its tail. The propelling charge, burning over the whole surface of the conical cavity, produces hot gas which rushes out through the constricted lower end of the case and drives the rocket upward. The rocket approaches the top of its flight by the time the charge is completely burned. The fire, however, is carried by a short powder train to the head of the rocket, where it ignites a bursting charge of black powder which blows out the head and sets fire to the stars, serpents, and crackers with which the head is filled.

Stars are pellets of combustible material. There is nothing in their appearance to suggest the magic which is in them. Lampblack, or Japanese, stars are commonly made either from lampblack and potassium chlorate or from lampblack and black-powder dust and antimony sulphide. The materials are mixed intimately, moistened with a solution of an adhesive, formed into cylindrical pellets or small cubes — three-eighths of an inch to three quarters of an inch on the side — and allowed to dry. Thrown out by a bursting rocket or an aerial bomb, they fall like glowing coals of fire and produce the beautiful willow-tree effect. As rockets start their flight slowly and accelerate after they are in the air, they may safely be charged with chlorate stars. But chlorate stars are sensitive to shock and are considered to be dangerous for use in bombs which are shot violently from mortars. Aluminum stars, made from powdered aluminum and potassium chlorate or perchlorate, burn with a dazzling white light. Indeed, the brilliancy of modern fireworks, of aerial displays, of airplane landing flares, and even of the flash which accompanies the explosion of a toy firecracker, is due to the use of aluminum and chlorate or perchlorate. A silver shower is produced by stars which are made from saltpeter, sulphur, charcoal, and realgar (red arsenic sulphide) — the materials which Hanzelet Lorrain (1630) used for the same purpose — and golden streamers are made by stars containing saltpeter, sulphur, and sodium oxalate. Steel stars, like penny sparklers, contain steel filings and scintillate when they burn. Steel gerbs (pronounced jurbs), or fountains, are made by loading a mixture, say of saltpeter, steel filings, and shellac, into a choked tube and packing it tightly into place. When the mixture burns, the fire rushing out from the constricted orifice carries with it the burning particles of steel. Electric spreader stars contain zinc dust and potassium dichromate along with chlorate and granular charcoal. They break up when they burn, and throw bright sparks over a space sometimes as large as 15 feet. Colored stars owe their color to mineral salts which give characteristic colors to the flame: strontium red, calcium pink, barium green, copper blue, and sodium yellow. A good blue fire composition is perhaps the most difficult to make, but satisfactory mixtures have been worked out which contain Paris green and calomel (mercurous chloride), the latter substance serving to impart volatility to the copper compounds.

Lances are paper tubes filled with colored-fire composition, burned usually in a horizontal position, and are used to make letters and designs in set pieces. Charcoal gerbs for soft sparks or steel gerbs for hard scin-



Paul J. Woolf

tillating ones are used in large display pieces and in such garden or lawn pieces as the "Mikado's Fan," "Golden Blossoms," "Diamond Star," "Pyric Fountain," and "True-Lover's Knot."

To make Roman candles, gunpowder and stars and a modified black-powder mixture which is known as Roman candle composition (or candle comp) are necessary. The candle composition is a mixture of powdered saltpeter, sulphur, and charcoal which has been moistened with a solution of dextrin, passed through a sieve, and dried. It burns more slowly than black powder and gives luminous sparks. The case is a long, narrow, strong tube of pasteboard plugged at the bottom with clay. Next to the clay is a small quantity of gunpowder; on top of this is a star; and on top of this, a layer of candle composition. The star is of such size that it does not fit the tube tightly; it rests upon the gunpowder, and the space between the star and the wall of the tube is filled with candle composition. When the three materials have been introduced, they are rammed tightly into place. Then gunpowder, a star, and candle composition again are loaded into the tube and rammed down, and so on until the tube is filled. When a Roman candle is lighted, the candle composition begins to burn and to throw out a fountain of sparks. The fire soon reaches the star, ignites it, and burns along the side of the star to light the gunpowder, which blows the burning star, like a projectile, out of the tube.

The tubes which make the wheels go round in many pyrotechnic display pieces are known as drivers and are loaded with a composition essentially the same as that which is used in rockets. They (*Continued on page 290*)

Low-Cost Shelter

Housing the Nineteen Million Families of Small Income Is the New Frontier of the Building Industry; Specific Problems for Which Answers Must Be Found

BY WALTER R. MACCORNACK

We seem to be moving, drifting steadily, against our will, against the will of every race and every people and every class, towards some hideous catastrophe. . . . But if you could introduce some new theme, in this case, the practical effect of a common purpose and of co-operation for a common end, then indeed it might be that these clinched fists would relax into open hands, that the reign of peace and freedom might begin, and that science, instead of being a shameful prisoner in the galleys of slaughter, might pour her wealth abounding into the cottage homes of every land.

— Winston Churchill, speaking in the House of Commons, April 14, 1937, on the civil war in Spain.

TO the foregoing indictment of the nations, Mr. Churchill offers only an abstract and generalized solution — a "new theme": a common purpose and co-operation for a common end. It is possible to bring that generalization as a whole a little nearer to practicality by saying that the common purpose should be a program of civilization building. But that, too, is a phrase so inclusive as to be — taken by itself — almost meaningless. I am concerned here with one practical aspect of such a general program, an aspect which is one of the most important problems of the building industry, which offers sweeping opportunity for co-operation for a common end, and the ignoring of which in the past may in all likelihood have contributed directly to the drift toward catastrophe that serves as basis for Mr. Churchill's foretelling of hideous catastrophe.

How may the benefits of low-cost shelter be extended to the millions of people to whom they are now denied? This is a direct and practical question, with which any program of civilization building must reckon. The answer to it does not by any means constitute the entire program, but it does offer a practical and important part of such a program, for it involves constructive achievement in political and social fields, in the arts, in science, and in industry. From the human point of view, moreover, low-cost housing for the disregarded millions is of profound

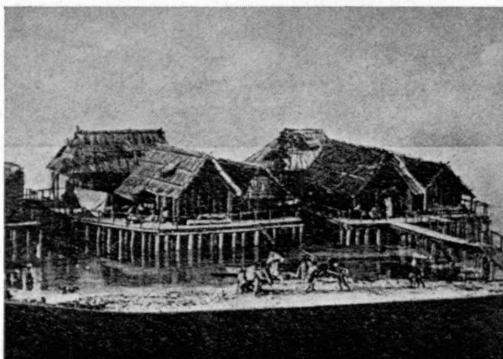
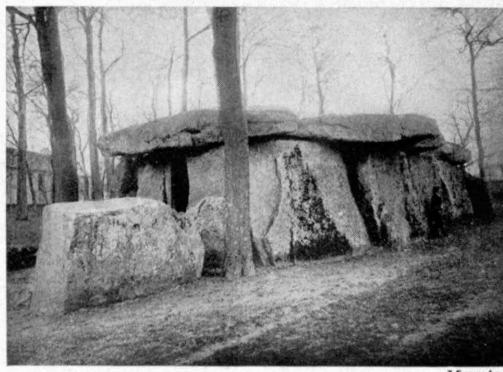
importance in its easily foreseeable effects upon the mood and atmosphere of life, upon content, upon adjustment to the environment, upon the sense of stability and security which, widespread among the masses, is the nation's bulwark against disaster.

The magnitude of the problem of low-cost shelter may be better understood by reference to figures from "Consumer Incomes in the United States: their Distribution in 1935-36," a report by the National Resources Committee issued in 1938. The estimates are that 12,358,000 families have incomes of less than \$1,000 a year and 6,862,000 families have incomes of between \$1,000 and \$1,500 a year. Thus more than nineteen million families in the United States have incomes of less than \$1,500 a year. But between 1929 and 1938 practically all construction of dwellings was by the families with incomes of

\$2,000 a year and over, leaving

these nineteen millions without the opportunity for adequate shelter except by means of government subsidy. Within this great reservoir of construction lies the opportunity of the building industry.

It is perfectly obvious from these figures that the income of a great mass of the people is below a standard which ultimately should be attained in this country. In a land of plenty and of unlimited scientific and industrial ingenuity, all of the people who are physically and mentally able should be self-supporting with respect to food, clothing, and shelter — the three basic requirements of living. The process of bringing about this economic independence should be the first order of business. When that is achieved, housing will cease to be the problem it is today. While we are waiting, however, it is the duty of the building industry to tackle the problem of devising ways and means for producing shelter at a cost far below that at the present time. The great gap between the ability to pay and the cost of shelter must be reduced. Though the American people have been led to believe



Very early housing: upper, a dolmen in France; lower, model of a lake village in Switzerland

that housing is a great mystery and that little is known about it, the truth is that it is one of our oldest activities; there never was any trouble in providing housing during periods when practices in the building industry were fair and not so complicated as are the methods of today.

In the early years of the development of America, a home was constructed of the materials found in its neighborhood and was put together, generally by the owner himself, with the simplest tools available. In other words, a home was owner built. Thus we find the colonist felling trees with his ax, fashioning timbers, joists, boarding, and shingles with an adz, and joining the parts with wooden pins. The foundation walls and sometimes the house itself were constructed of brick fashioned from local clay or of stone from the near-by hills, the hardware was fashioned by the local blacksmith, the house was illuminated by home-made candles, and heating was by means of open fireplaces.

As time went on and social life became more complicated, the sawmill and the planing mill came into existence; the men of the villages began to specialize in their work. So were developed carpentry and masonry, the two trades most essential in the creation of a home. The home builder began to use the services of the men engaged in these trades, paying either in barter or in cash. Later on, one man with more initiative than the others began to contract to build houses, employing others to help him. He began to import materials from greater distances, and thus the complications in the construction of homes began to grow. As further new materials and equipment began to be used, more types of craftsmen developed.

Today, as a consequence, our buildings are made of many materials unused at the time of the founding of the country and are put together by craftsmen of many trades. Materials are imported from distances necessitating additional handling and transportation costs. Trade unions' rules, contractors' regulations, constantly growing restrictions in building codes, zoning laws, increase in taxation, the addition of the middleman to handle the distribution of products, the increased costs of land and of financing — all have added to the problem. These and other elements have brought about the present complicated condition in the production of homes.



E. O. Hoppé: *Romantic America*



Top: New Mexican pueblo; center: English farm-house; bottom: Spanish cottage



Yet the income of the home builder, while it has increased over that of the early days, has actually decreased because of the increase in the cost of living. Thus the gap between the ability to pay and the cost of production of homes has widened until now it is impossible for our low-income groups either to own or to rent decent living accommodations. This condition has brought about the housing subsidy which has reached such proportions that the solution of this question is of major importance to all of us. It is becoming obvious that government subsidy for the production of decent dwellings for the lower third of our population will bring about so large an outlay of money as to make the continuation of such a program dangerous and unwise. In addition to the hundreds of millions of dollars being spent by the United States Housing Authority for slum elimination in our cities, proposal is made to allot two hundred million dollars to the construction of homes in rural areas. Some say this program is a political expedient for spreading the benefits of home subsidy to those living in country districts. There may be some truth to this charge, because many congressmen from rural districts were found rallying to the support of the housing bill.

It is a long step from the well-constructed owner-built homes of the early days of our country to a staggering program of subsidized construction for people living in the rural areas. A strong protest should be made against any such program that does not include as one of its elements the use of the owner's services in the construction of his own home whenever possible. No thinking person who has the welfare of this country at heart will maintain for one minute that better housing is not necessary; but for the purpose of reducing costs to a fair level, the true friends of housing must insist on the elimination of all political expediency and unfair practices in this field.

Housing in America will be carried forward by the generations now in our schools, since the program is a long-range and continuing one. It is quite disheartening, in listening to discussions and in reading statements on architectural education, to find that they have narrowed down to the unimportant and much overstressed argument now going on between the so-called traditionalists and the so-called modernists. In the addresses

and writings on architectural education, there is little evidence that either group has seriously considered the great social and economic problems involved in this subject. The housing exhibits which appear from time to time also reflect a pathetic lack of understanding of the problem of shelter. They seem to take into account only the emotional side, and here again is reflected a narrow controversy over questions of different styles.

The solution of problems of shelter should be given more recognition in our schools. Housing, which is definitely related to the question of the rebuilding of cities and the solution of the problem of low-cost shelter, with all of the attendant social and economic considerations, is much more important to the architect who is to become a leader in his field than is all of the detailed knowledge of the chemical and physical properties of building materials which may be crowded into his course. Thus for the sake of this low-cost housing program, the architects who are to assume the leadership in the future must have thorough grounding in the basic questions, which are social and economic; sound grounding in construction; and knowledge of all the divergent elements which are making progress difficult. More than that, with all this specialized knowledge they will fail as leaders unless they have the courage to attack each problem in its order and to dispose, one by one, of the evils which each problem contains.

Cutting the cost of housing for the lower-income third of our population involves two chief forms of shelter — the small house and the multiple-dwelling unit to replace slums — each of which is surrounded with special problems. The specific difficulties and suggested points where attack may be made on them are outlined here.

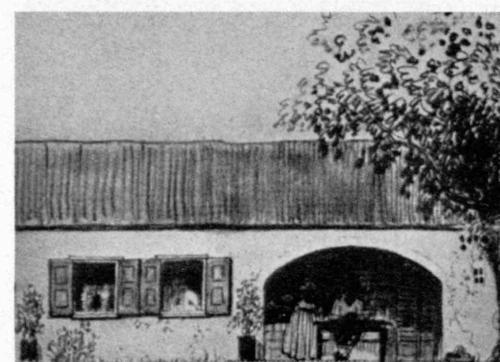
In the small-house problem, three agencies are involved: The first is the American Institute of Architects, which has long been sponsoring a program to furnish drawings, specifications, and supervision on low-cost individual houses at fees which are commensurate with the owners' ability to pay. The principle upon which this plan operates is that of the reuse of the drawings. The second agency is the Producers' Council, Inc., which is made up of manufacturers of building materials. Its co-operation, through study and promotion of the use of new materials, processes, and distribution methods which will



Samuel V. Chamberlain, '18



Arthur C. Haskell



Top: Cape Cod original; center: New England present day; bottom: Virgin Islands

lower costs, is essential for the creation of more practical buildings and the reduction of costs. The third agency is the lending institutions. Their function is to refuse to make loans on houses which are not properly constructed and supervised. This sound business procedure is for the protection of the loans. The history of the foreclosures by the Federal Home Loan Bank Board shows that a great proportion of the failures were in the types of

houses erected by speculative builders without proper plans and without supervision. The speculative builder is the judge, jury, and prosecutor; hundreds of thousands of home owners have lost their homes because he is.

The small-house program has for its objectives the radical reduction of building costs in small homes and the production of well-designed, well-built dwellings which become sound investments. The idea of the partially owner-built home is being introduced when the income of the builder is very low and the conditions of employment in his district make the plan practical. Generally speaking, house construction in rural areas does not fall heir to so many of the ills as does housing in our cities.

The matter of shelter for the city dwellers in slum areas is a similarly complicated one. The United States Housing Authority Act permits the capital cost per room in cities of 500,000 population and less to be \$1,000, and in cities of more than that population, \$1,250. The result of the Public Works Administration and Housing Authority programs to date has been the production of dwelling units averaging from \$4,500 to \$5,000 each, all costs included, depending on the locality. It is obvious that the great mass of the American people who are now attempting, with private capital, to build homes of their own whose cost must not exceed \$3,000 to \$3,500, are being saddled with taxes to provide the money to carry on slum clearance

at a price level above that which can be afforded by the small-income citizens who are attempting to pay their own way. The main objective in a drive to solve the slum-clearance question, then, is that of bringing about a radical reduction in the over-all costs of shelter.

The aim of such a program should be to reduce the cost of housing to at least \$300 a room by direct attack on specific aspects of the problem, which I shall outline below. The history of the (Continued on page 291)

Manipulating the Microwaves

Ultrahigh-Frequency Radiation Offers Tremendous Value for Varied Tasks, from Guiding Airplanes to Drying Vegetables; Technology's Broad Research in the Field

BY EDWARD L. BOWLES

PARTLY because men can't see through fog and partly because they have found ways of giving groups of electrons swifter collective kicks, understanding of ultrahigh radio-frequency phenomena has been greatly advanced in recent years and promises further interesting and important developments. During the past dozen years, Technology investigators have been engaged on various aspects of the problem of the generation, propagation, and use of microwaves — radio waves of such short lengths, or high frequencies, that they possess properties of very great potential value. Out of this work have been evolved both the essential theoretical understanding and the necessary practical instrumentation, so that co-ordinated, joint work on a half-dozen fronts is being carried on at present, with the co-operation of the Civil Aeronautics Authority, the Sperry Gyroscope Company, Inc., the International Telephone and Telegraph Company, the General Radio Company, the Alfred L. Loomis Laboratories, the Carnegie Corporation, and others.

The wavelengths at which the Technology group is working are of the same order as those employed by Heinrich Hertz after he had, in 1888, confirmed Maxwell's theory predicting the existence of electrical waves in space. A gauge of the dimensions of these waves may readily be had by reference to the dial of a standard home radio-receiving set. A typical wave in the mid region of the broadcast band has a length of approximately three hundred meters from peak to peak. Short waves, as the standard radio set conceives them, are from 200 to 15 meters from peak to peak. Ultrahigh-frequency waves may be said to extend from 15 meters down to but a few centimeters. These centimeter waves are to the conventional short waves about what short waves are to the standard broadcast band.

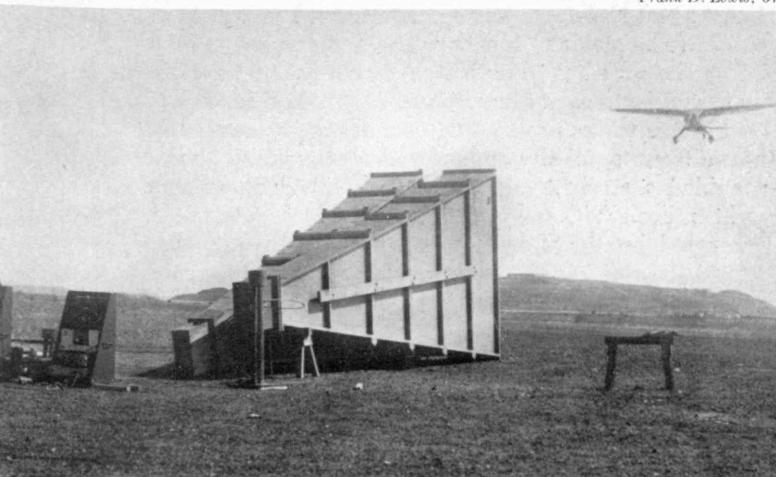
During early experimentation with electromagnetic radiation — in Hertz's day, for instance — only very short, damped waves were employed, generated by the discharge of a condenser through a spark gap and a

rudimentary coil. Some of the early waves were but a few centimeters in length. The power was greater as the voltage across the gap was made greater. To secure greater power and to span points beyond the horizon, however, it was necessary to increase the size of the condensers, with consequent corresponding increase in wavelength. With these crude methods, the high-power transoceanic stations were forced to go to wavelengths of 10 to 20 kilometers in the effort to get waves of sufficient power to cross the ocean, and because the waves were damped, they could not be continuously modulated to transmit speech but were limited to the sending of rough raspy dots and dashes as code. But for the development of vacuum tube technique during the past thirty years, we should still be forced to rely on these low frequencies and the limitations their discontinuous nature imposed. It is possible now, however, to secure undamped or continuous oscillations over a very great range of frequencies with many kilowatts of power, and they are as vital to the melting of metal and the disintegration of atoms as to communications.

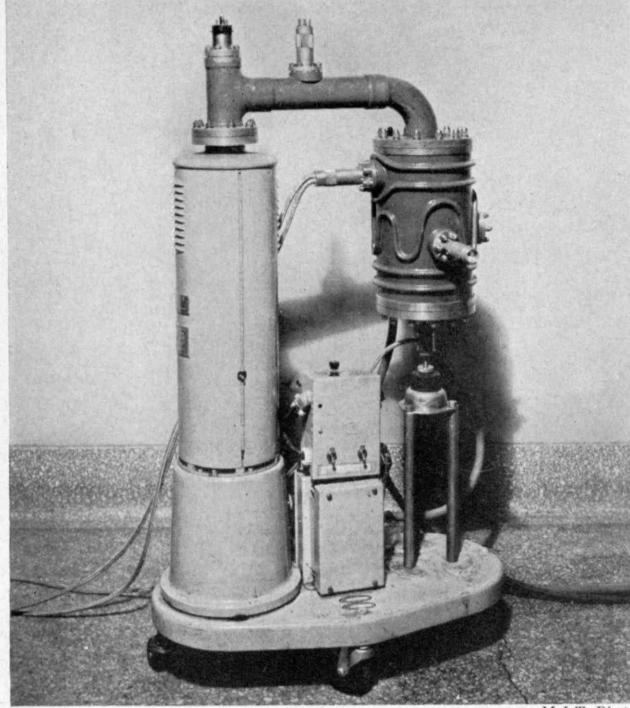
In running the gamut of these frequencies, interest now focuses on the microwaves, the value of which promises to be truly tremendous. These waves may be formed into beams so sharp that a point-to-point relay system utilizing them may be accomplished with comparatively little power, owing to the concentration of the available energy, searchlight-like, upon the receivers. This power of being combined in a controlled ray makes the microwaves similarly valuable as solution to many vexing problems of airplane navigation and ship navigation as well. Furthermore, since variations of temperature, density, and so on, in the atmosphere somewhat affect the propagation of these waves, they not only serve as a means for further study of the state of the atmosphere and troposphere but they may also become a useful aid to the meteorologist in forecasting the weather.

In addition, a wide range of technical applications in industry is in view. One possible example of these is the reducing of the shipping weight of vegetables by controlled dehydration through the use of microwaves prior to shipment. The practical development of ultrahigh-frequency apparatus and methods thus is opening a whole new field and bringing to bear on technology and industry a new influence of far-reaching importance. Active interest at the Institute in the ultrashort waves dates back to the beginning of research into the general

Frank D. Lewis, '37



The C.A.A.-M.I.T. instrument landing system in operation. The plane is flying down an equisignal beam produced by overlapping components from the two large electromagnetic horns.



M.I.T. Photo

The Stanford klystron, as built by the Sperry Gyroscope Company, Inc., and used in the M.I.T. ultrahigh-frequency studies

problem of navigation in fog, which was undertaken in the late 1920's at the Round Hill estate of the late Colonel E. H. R. Green. The possibilities of signaling by means of sound waves, light waves, or radio waves in order to guide a pilot through fog were explored. Because they penetrate rain, fog, and snow far better than do light or sound waves, radio waves were found to be particularly adapted to the task, and the shorter they were, the better they would do it. To produce radio beams which will serve as paths to be followed, which will by their reflection indicate the presence of neighboring vessels, or which will provide radio paths free from variational effects of the ground, shorter waves are essential, because they can be directed more readily. The shorter the wavelength, the more effectively the beam may be controlled and directed by a directive device of a given over-all size. Since for vessels and particularly for aircraft, apparatus must be relatively small, here is further reason for effort to reach shorter and shorter useful wavelengths.

Early in the Round Hill fog work, prediction was made that the answer to the aircraft landing problem would probably be found in the use of radio waves 50 centimeters long — waves of a shortness then spectacular. Significantly, the undamped waves used in early experiments on the spatial distribution of radiation about a vertical antenna at Round Hill were about ten meters in length, comparing closely with the waves of 9.6 meters' length which Hertz had used in his first experiment forty years before. Later on, Hertz, in investigating direction, polarization, and refraction of the waves, worked with a damped wave generator yielding waves 66 centimeters in length. Present work by the Institute group concerned with instrument landing of airplanes employs waves of the order of 50 centimeters in length. Thus the present-day investigator is back where Hertz was, with the one all-important difference that present-day ultrashort waves are continuous.

The development of a dependable convenient source of supply of ultrashort waves, essential to their application, grows out of the ability to sort a stream of electrons into groups and to accelerate the groups at a determined and uniform rate. This principle of velocity

modulation, announced at about the same time by Stanford University, the General Electric Company, and the Radio Corporation of America, and inherent but unrecognized in some earlier devices, appears to open the way to increased power, amplification, modulation, and frequency-multiplication at ultrahigh frequencies. A representative embodiment of this principle is the klystron tube, which was perfected by Stanford University physicists and of which first public announcement was made in *The Review* for February, 1939, page 156. This device, whose function is essentially to speed up members of a stream of electrons by recurrent pulses so that by the time they have passed through the tube they compose a series of swiftly moving groups, is a simple yet powerful source of ultrahigh-frequency energy — the raw material essential to the construction of the sensitive directable beams necessary to the instrument landing of airplanes, to communication, and to various other probable useful applications.

Given, then, the demonstration of the great utility of such waves and given the dependable and powerful source of supply which the principle of velocity modulation assures, there remains the necessity for apparatus which will so propagate ultrashort-wave radiation as to permit its practical employment. A highly satisfactory answer to this necessity has come out of the discovery at the Institute and at the Bell Telephone Laboratories, announced in 1936, of a new technique — subtly presaged by another historic parallel, the speculations of Rayleigh in the late '90's — of transmitting microwaves through the inside of an empty metal pipe. From the point of view of microwave transmission, this advance was of basic importance in several ways. The hollow tube itself serves as a "wire" for conducting energy between the components of a piece of apparatus that employs absolutely no insulation in the usual sense — very valuable since at these frequencies tremendous losses are inescapably associated with the use of insulators.

A closed section of the pipe, properly adjusted in shape and size, provides a cavity resonator — a single piece of space doing at these high frequencies what the coil and condenser do at lower frequencies. As resonators, these cavities may compare favorably in quality with the best quartz crystals. Their use in microwave filters to pass and suppress bands of frequencies is already in evidence. Perhaps even more important, however, is the fact that a flared section of pipe is a remarkably effective and rugged directive antenna — the electromagnetic horn originally described in *The Review* for July, 1936.

The first general synthesis of these and related elements and of the theory underlying them is in the C.A.A.-M.I.T. system for the instrument landing of airplanes (*The Review*, January, 1939). By this, the pilot is kept informed as to both his location and orientation by the indications of a single instrument. In recent tests, centimeter waves propagated in a delicately controlled beam from specially designed electromagnetic horns provided a straight glide path for a distance of over eight miles. With an estimated power of 50 watts, generated by the velocity-modulation technique, supplied to one of the horns and with a specially designed superheterodyne receiver used in a test plane, extremely

strong signals were received at a distance of 25 miles and an altitude of 2,500 feet. Usable landing signals, it appears, may be obtained at distances of the order of 50 to 75 miles. Microwave glide-path equipment such as this, in the opinion of a conference group of the National Academy of Sciences appointed at the request of the President of the United States to study the standardization of instrument landing equipment, "offers great promise" of improving limitations on other systems and of providing advantages in lesser weight of plane equipment, decrease of aerodynamic drag of antenna systems, and freedom from error due to alterations in the sensitivity of the receiver.

The central ideas vitalizing the C.A.A.-M.I.T. instrument landing system thus had their origin — the full implications of which were partly unsuspected — at Round Hill in the 1920's. Out of the active and co-ordinated microwave research program now under way in Cambridge, it is hoped that equally fruitful ideas will come, and it is likely at least that their implications will be comprehended earlier. With the organization of an ultrahigh-frequency laboratory in the Institute as a center, with the co-operation of scientists from various Departments, and with the collaboration of industry and individuals in sponsored research projects, the Institute group is now engaged in following out the ramifications of all those aspects of microwave technique which appear potentially useful from the point of view of practical application or fundamentally necessary from the point of view of scientific theory. One phase of the general program — basic research into the mysteries of dielectrics, fully described in The Review for last December — has already demonstrated unusual promise. Expectations run similarly high for the other aspects of the general investigation.

The ultrahigh-frequency laboratory is intended to develop the facilities of the Institute for work in this field in order, first, to assist in the general instruction of senior and graduate students and, second, to provide a background of experience and equipment for research. So far, work has been concentrated on the investigation of power sources and measuring technique and apparatus in a wavelength range up to about ten centimeters. A klystron oscillator is being constructed, with the aim of affording more concrete knowledge of the design factors affecting its performance. Power sources utilizing the best available conventional tubes and also unconventional magnetron oscillators are being developed at the same time. As a result of the development of special vacuum technique, experimental vacuum tubes can be assembled and experimented with while they are still on the pump, and changes can be made in their physical dimensions and arrangements while they are in vacuum. Equipment and methods for making the measurement of voltage and field intensity as precise as that possible at lower frequencies are being developed.

A group of methods of voltage measurement that depend on as widely different principles as possible and use dissimilar materials for their principal elements have been developed to the point where their expected behavior as a function of frequency can be predicted with seeming accuracy up to and including the ultrahigh frequencies, on the basis of Maxwell's theory. These

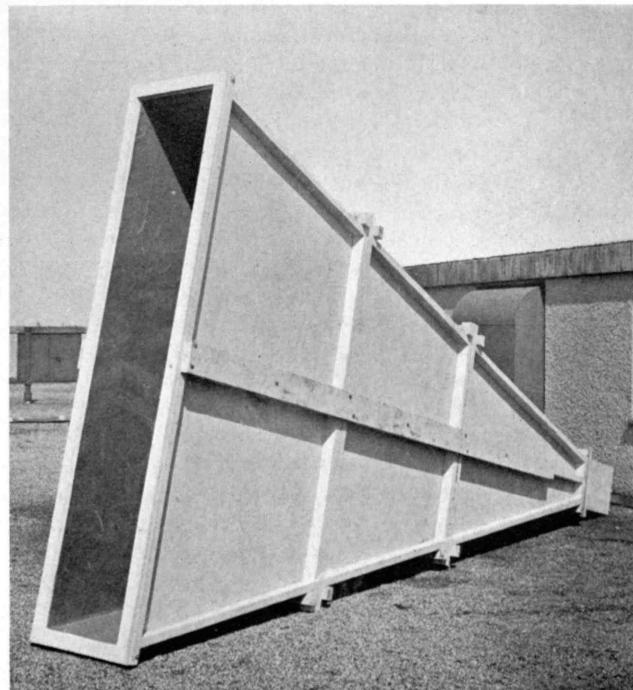
methods are now being compared among themselves; the one that appears the most practical will be investigated rather carefully for its behavior at the ultrahigh frequencies.

For the propagation of the waves whose generation and measurement are being thus studied, further work is under way on the electromagnetic horns which have already demonstrated such value in the instrument landing system. This research began, of course, in the original investigation of hollow pipes and has been continued with increasing vigor. This program has been aimed at fundamental questions concerning hollow-pipe transmission systems, horn antennas, and resonators. A biconical horn for production of uniform horizontal radiation or reception, arrays of horns employing a number of smaller horns connected together for the production of very sharp and steerable beams, horns constructed of wire mesh or screening for greater economy or lessened wind resistance, stabilizing circuits for magnetron generators, and a method of measuring the impedance of hollow-pipe terminations and of other elements in pipes are among tangible results already obtained in this phase of the general research.

Types of cavity resonators deriving from hollow-pipe and coaxial-line techniques are the basis of two recent projects of particular interest — one a comprehensive theoretical and experimental study of oscillation modes of cavity resonators of the shape often used in ultrahigh-frequency circuits. The other is the development of a new type of magnetron employing a cavity resonator as the oscillating system and operating with improved stability and efficiency at the shorter microwaves because of the low losses of the resonator. At the present time, work is centered on communication problems at wavelengths of about ten centimeters. A new plan for producing knife-sharp beams of smooth shape is under critical study and already has demonstrated favorable characteristics. Now under development is a receiver of high sensitivity and stability that will incorporate the newest techniques of pipes, resonators, superheterodyne converters, and oscillators. Since the receiver is the weakest part of the radio system at these wavelengths today (Continued on page 292)

M.I.T. Photo

An electromagnetic horn mounted on the roof of the Institute for use in study of signal intensity over various distances and in different directions



Friction, Fuzz, and Hair Oil

Boundary Lubrication a Problem of Extreme Importance in the Design of Better Machines; Measurements of Surface Phenomena Valuable to the Engineer

BY JOHN WULFF

IT is said of the late Professor Charles R. Cross, '70, who took great pride in his physics demonstration lectures at the Institute, that he always made sure gravity was still working before he rechecked his experiments for each lecture. Friction, he maintained, did not require checking. Remarkable examples of useful frictional effects and the avoidance of harmful ones are to be found in nature: "applied" friction for nonskidding properties in the cloven and corrugated hoofs of the mountain goat, and a well-finished, lubricated, and "useful" bearing in the elbow joint of Mr. Joe Louis.

When one turns from nature to artifice, one finds that the mechanics of fluid lubrication is quite well understood at present. This subject has been ably presented in these pages (November, 1938) by Milton B. Dobrin, '36. In many cases fluid lubrication breaks down; when it does, the thick film of perfect lubrication is thinned to one of molecular dimensions — to boundary lubrication. When this stage is reached, an increase in the coefficient of friction usually takes place; rupture of the infinitesimal film may lead if not to seizure certainly to wear. When an engine is started or stopped, or when two parallel flat surfaces are slid over one another, boundary lubrication usually is involved. The lubricant may not always be oil but it is always a film of something, since solid boundaries have a great affinity for gas, liquid, and muck of all kinds, which they readily adsorb or combine with chemically.

One of the least understood problems in engineering science is boundary lubrication. It is of extreme importance in the design of faster running, more efficient machines. An understanding of the problem requires knowledge of the mechanism of friction between mating surfaces and of the effect of the

composition and structure of the metal, as well as of the presence of surface films. Unless physicist and chemist, metallurgist and oil technologist, machinist and designing engineer co-operate, advancement in this field will continue to be slow and the literature of the subject will continue to be handicapped by the mumbo jumbo of the patent-medicine salesman. Although much research is being carried out in industrial and academic laboratories, more is required. It is the purpose of this article to present the results of recent experiments in this field.

Any furniture mover learns two facts quickly by experience: A box will slide equally well on its side, edge, or end; and the smoothest side is preferable for easy slip. Amontons, in the Seventeenth Century, expressed this idea by saying that the tangential force necessary to slide one surface over another is proportional to the weight of the slider and is independent of the area of the slider. De Coulomb later proposed an explanation based on the surface roughness or geometrical profile of the slipping surface. The interlocking asperities of two surfaces are a hindrance to slip. To move the slider we have to lift it over the asperities of the base. Coulomb did not like his own theory any too well, for he knew that a little oil or even water would reduce the frictional resistance without changing the surface roughness. His later critics — Holm, F. P. Bowden, and others — showed that in vacuum for perfectly film-free surfaces the coefficient of friction was some sixty times as great as for the same surfaces in air. Coulomb's original views are also in disfavor on the ground that the energy dissipated in friction must be lost in the vibrations set up in the interior of the mating solids by the bumping of the two

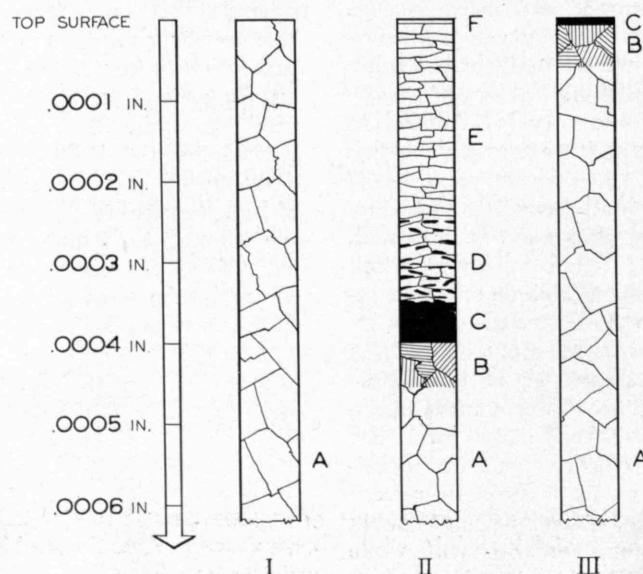


Fig. 1. Schematic representation of results of electron-diffraction studies concerning the finishing of metals. Column I represents coarse-grained alloy steel. Successive studies reveal constant nature of core material. Column II: results of successive etching and electron-diffraction pictures of same material which has previously received high-speed and pressure grinding treatment. F is the oxide layer; E, the hot-worked deformed metal region; D, transition region of hot and cold deformation; C, region of cold deformation; B, transition region; A, again core material. Column III represents cross section of same core material which has been finely lapped (low pressure and speed — multi-motion). C again is cold worked, and B is transition layer. Note depth of working effects.

surfaces over each other, generating heat throughout the metal instead of locally at the surface, as recent researches of Bowden and his co-workers show.

The arguments of the modern proponents of friction as a phenomenon of adhesion should be mentioned. If a sphere be pushed against a plane, the theory of elasticity requires an area of contact proportional to the two-thirds power of the force. Yet if the sphere deform plastically, flow takes place, and the final contact area will depend on the properties of the materials in contact and on the normal load. Thus two optical flats may be in contact at only three places, but the force per unit area on such contacts will be enormous, causing them to deform and to assume a final contact area proportional to the weight of the rider. This view seems to be borne out by some recent conductivity measurements of Bowden and others. Thus if we distinguish between the real contact area of the rider and the apparent area of the rider, we may say with Amontons that the coefficient of friction is equal to the ratio of frictional force and normal load, and add that this in turn is equal to the ratio of frictional force and the true contact area.

Various experiments cast doubt on Bowden's work. The question which they raise, bluntly put, is that since plastic deformation is an irreversible process, should not frictional force be twice as great as ordinarily if two mating surfaces have been previously doubly over-loaded. Recent experiments show elastic as well as plastic deformation in amounts depending on the material and surface properties of the materials in contact, and indicate that the coefficient of friction itself or the proportionality factor between frictional force and contact area at normal load has a complicated dependence on a host of factors besides plastic deformation, including the rate and prehistory of loading before slip occurs.

The work of Bowden also indicates that sliding friction is not a continuous process, but that the motion proceeds in repeated jerks. Simultaneous temperature measurements using the contacting surfaces as a thermocouple indicate that, at the instant of slip, temperature flashes occur which are of the order of the melting point of the contact material having the lower melting point. Microscopic evidence verifies the view that kinetic friction is a process of momentary welding and subsequent breaking of welds. Tears and gouges are of appreciable area and depth. With a thin film of lubricant, finely polished surfaces still show intermittent clutching and breaking. For films of long-chain fatty acids, continuous

sliding takes place, and, of course, the coefficient of friction is less. The latter fact has been demonstrated by many other workers, among the first being the English chemist W. B. Hardy. With modern electron-diffraction apparatus, it is possible to show that such fatty acids stand up in regimented fashion on a smooth metallic surface, held there no doubt by residual valence forces of the surface atoms.

Evidently we must come to an atomic explanation of adhesion. G. A. Tomlinson, George Karelitz, and others have trod this path. By increasing the normal load between two rubbing surfaces, we not only produce more contact area, whether by elastic or plastic deformation of the asperities, but produce atomic welds in the cold state. Naturally, tightly adherent films or other contaminations reduce the probability of welding, and fatty acids — since they are not easily broken through — reduce it further. Above certain temperatures the coefficient of friction is greater. These temperatures are found to be very close to the sintering temperatures for metallic powders in contact.

Friction experiments with the same bearing materials having the riders finished to different degrees of smoothness — the asperities varying from the ideal geometrical boundary by an average of ten microinches or more — show an increase in the coefficient of friction with increasing roughness. The critic who does not like Coulomb's idea of interlocking asperities will probably say that the sharp hills permit puncture of the boundary film and thus accelerate adhesion more readily than with smoother surfaces. In any case, the coefficient of friction for A sliding on B is not a simple term, but for extremely smooth mating surfaces, adhesion plays a dominant role.

A number of facts follow from the foregoing — facts known to any mechanic: (1) that two bearing surfaces should fit and be as smooth as is economically feasible; (2) that some lubricants are better than others; (3) that unlike metals give lower coefficients of friction; (4) that in order to reduce wear and liability of seizure, bearings should be designed to lower to a minimum the possibility of running under conditions of boundary lubrication.

In an ordinary bearing assembly, the shaft is usually made of some metal of suitable strength and hardness machined according to certain geometrical specifications. Machines are now available which will give a smoother finish to the surface by the use of fixed, and sometimes of more or less loose, abrasives. These are variously classified as grinding, honing, and lapping

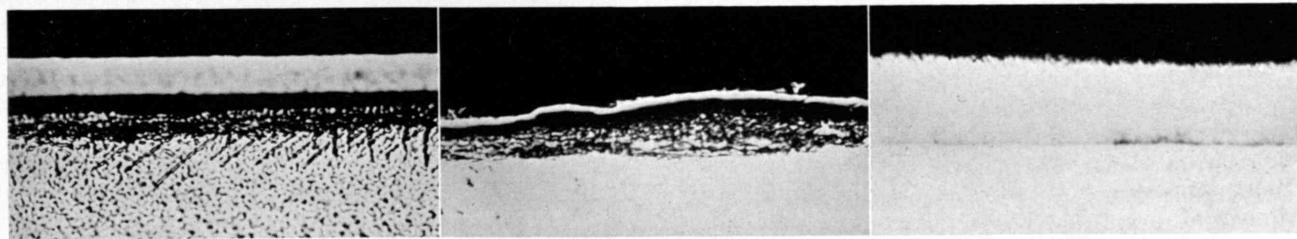


Fig. 2. Left. Photomicrograph — at 750 magnification — of cross section of a ground-brass surface. Top black is Bakelite mounting; top white, nickel plating to preserve profile of fine grinding; next black layer, region of hot working; next, transition layer including hot and cold working. Mottled core material is a portion of a single crystallite of the initial material unchanged by grinding. Center. Comparison with Fig. 1 shows that for an altogether different material the depth as well as the nature of the effects produced by grinding is the same. This is the profile of a coarsely ground surface of a bronze crystallite. Right. Profile of a lapped bronze. Mechanical and thermal effects produced are beyond resolving power of microscope, but electron-diffraction studies indicate results like Col. III, Fig. 1.

machines. They may be distinguished in two ways: (1) They may accomplish their work by high speed and pressure on the cutting tool, or by low speed and pressure; (2) they may remove metal by multidirectional motion which leaves a random arrangement of scratches on the surface, or by more regular motion which leaves a geometrical pattern of scratches. The hard parts of a bearing assembly can be formed by grinding (high speed and pressure usually giving a geometrical scratch pattern) and finished by lapping (multimotion, random scratch pattern). This gives a finer fitting and smoother surface usually too costly except for custom work. Honing with a fixed abrasive has more specialized application. The mechanics of these motions is extremely old, as are the methods used to accomplish them. In the last decade, however, industry — especially the automotive, aeronautical, and machine-tool industries — has become extremely conscious of the importance of surface finish. This recognition was expedited by the steady advance made in methods of measuring and interpreting surface characteristics. Nowadays there are multimotion grinding machines which employ extremely high pressures and speeds and give finishes which look as good to the eye as those made by hand or by machine lapping, and are ever so much faster. In this country, D. A. Wallace has helped to develop a multimotion machine which, though using essentially the same speed and pressure as a lapping machine, can achieve an equally smooth surface in very much less time. The lapping machine gives a truer geometrical surface as well as a fine finish, however, whereas the others aim to improve only the finish.

Instruments exist which permit the manufacturer to specify the smoothness of surfaces made in production. These measure the elevation of the surface at every point with respect to some reference surface. In practice it is usually sufficient merely to describe the shape of one or more profile curves or traces of vertical planes through the surface. Of the many mechanical, optical, hydraulic, and chemical methods, the profilometer developed by E. J. Abbott has the widest application; it gives the root-mean-square value of the displacement of a tracing needle (diamond) relative to a mean position and expresses the result by meter readings in microinches or permits a magnified profilographic representation. Such devices permit a standardization which makes for sounder specification and thus for economy. It is possible to finish by various methods surfaces of the same material which give readings of two microinches. Yet from a strength, friction, corrosion, and erosion standpoint, these surfaces will not, in practice, behave alike.

The possible reason may be seen in Fig. 1, where the results of an electron-diffraction analysis are schematically represented. Stainless steel of the 18:8 variety was employed, for it exhibits crystalline structures more sensitive to thermal and mechanical effects than do many other steels. Numerous samples of this material were first annealed to produce a large grain size; they were then lapped to optical flatness, and electrolytically etched to remove the effects of surface working. They were next sent to various finishing experts who used but one type of process to accomplish a fine finish. All of the samples measured the same on an Abbott profilometer, although they appeared different to the eye and under the microscope. Electron-diffraction pictures of the freshly prepared surface were obtained. The surface was then etched uniformly to remove about thirty atomic layers, another diffraction picture was obtained, and the process was continued down to the core material. The results can be checked microscopically for other alloys for high-speed, high-pressure surface-finishing operations; but for low-speed, low-pressure finishing, the changes in structure are, for most materials, beyond the resolving power of a microscope.

The data obtained in this way, combined with the temperature measurements

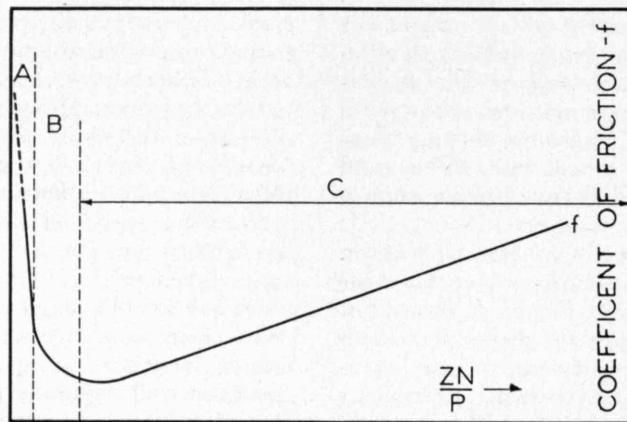


Fig. 3. Friction curve of journal-bearing performance. The coefficient of friction is plotted against the bearing characteristic number ZN/P , where Z is the viscosity of the lubricant, N is the speed of shaft, and P is the bearing pressure on the projected area. The bearing, when starting or stopping, usually performs in the regions of dry friction (A) or semifluid lubrication (B), and these regions are termed in the text "boundary lubrication." C represents the fluid lubrication region.

of Bowden and his co-workers, indicate possibly why extremely hard steels show surface cracks after high-speed pressure grinding. The similarity of metallurgical results between superfinishing and machine lapping — the former requiring less than two minutes and the latter, more than twenty-four hours — occasions further comment on superfinishing. In this process a relatively coarse stone (600-mesh bonded abrasive) is used, work and stone both move, and the cutting fluid used serves as a lubricant more than as a coolant. The asperities are sheared off and, when the workpiece is of sufficient smoothness, the oil film, lifting the stone from the work, prevents further cutting. Thus such scratches as remain are essentially below the major surface. With high-speed, high-pressure grinding machines operated on the multimotion principle, there is a tendency, because of the high temperature engendered, to fill in scratches by plastic flow. Some experimenters have maintained that this results in "amorphous" metal, or "fuzz." Such surfaces are often loaded with abrasive and oxide, and exhibit results of hot working known to the metallurgist as typical. For some materials and application this method may serve its purpose as well as does superfinishing.

We have written little as yet about a bearing surface for our excellently finished hard-surfaced shaft. As mentioned before, this surface (Continued on page 296)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Summer Session

THE Institute's summer session this year will be a particularly active one, for in addition to the regular courses the program will include four important conferences and fourteen special courses of notable interest to industry. A conference on friction and surface finish will be held on June 5, 6, and 7 under the direction of Jerome C. Hunsaker, '12, Head of the Department of Mechanical Engineering. This conference will bring together physicists, chemists, metallurgists, oil technologists, and designing and producing engineers to study problems concerning boundary lubrication — the critical and illusive phenomenon of friction which occurs just before failure (see page 282). Associated with Dr. Hunsaker in conducting the conference will be Robert S. Williams, '02, Head of the Department of Metallurgy; John Wulff, Associate Professor of Physical Metallurgy; and John M. Lessells, Associate Professor of Mechanical Engineering.

The eighth summer conference on spectroscopy, to be held on July 15, 16, and 17, will include discussion of the spectroscopic analysis of materials and other applications of spectroscopy to biology, medicine, chemistry, metallurgy, mineralogy,

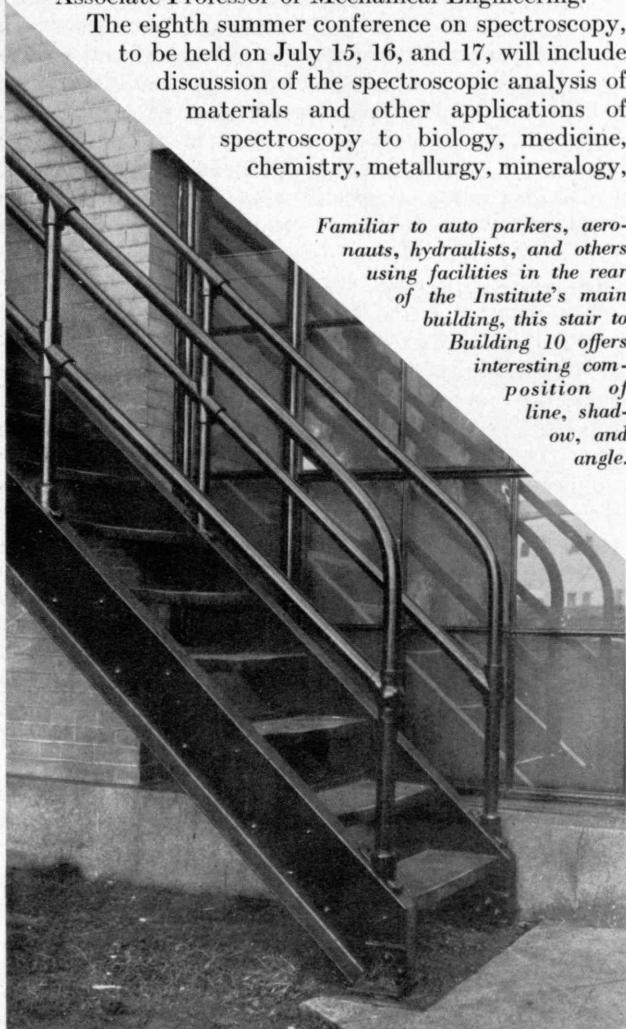
and industrial and engineering problems. The conference will be directed by George R. Harrison, Professor of Physics.

The solution of complex scientific and engineering problems with the aid of the Institute's differential analyzer will be the subject of a conference to be held in the Institute's Center of Analysis from July 8 through July 12 under the direction of Samuel H. Caldwell, '25, Assistant Professor of Electrical Engineering. The demonstrated utility and power of the differential analyzer now make it the outstanding means of solving ordinary differential equations that are not readily handled by formal methods. The conference, therefore, offers scientific workers engaged in fields which involve differential equations the opportunity to familiarize themselves with the design and operating characteristics of the machine.

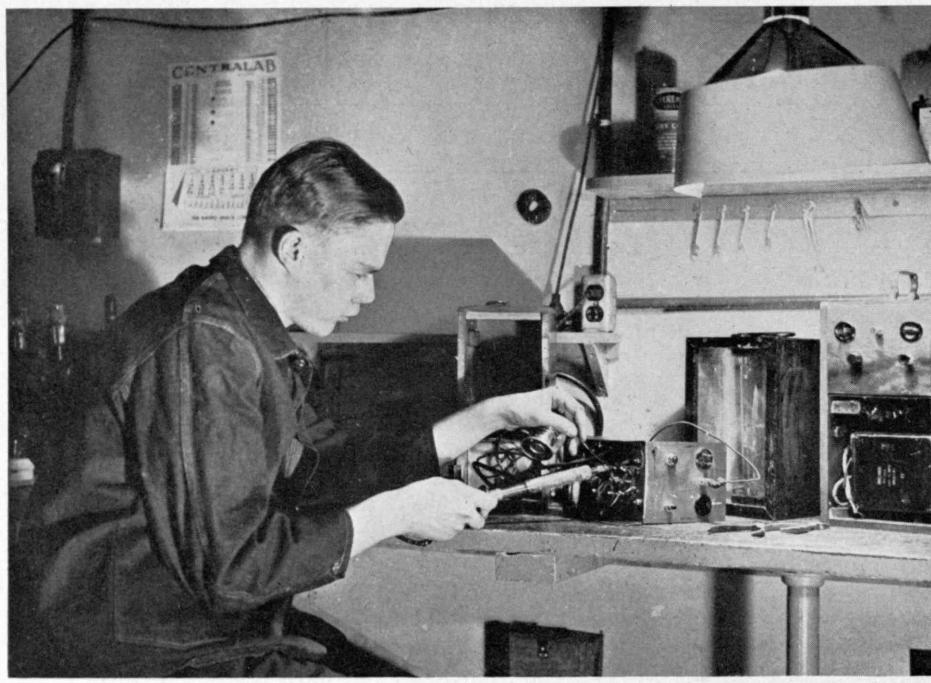
Powder metallurgy will be discussed in a late summer conference on August 29, 30, and 31, which will bring to the Institute a group interested in the fundamental scientific and engineering problems of powder metallurgy, the present state of industrial application, possible future developments, and research necessary to advance this significant process. The conference will be under the leadership of Professor Wulff, a recognized authority in this field.

The special summer courses will include six weeks of instruction in practical and applied spectroscopy, which will be given from June 10 to July 20 under the direction of Professor Harrison. For five weeks, beginning on June 17, Ernst A. Hauser, Associate Professor of Chemical Engineering, will give his fifth important summer course in theoretical and applied physics and physics of matter in the colloidal state.

The Department of Biology and Public Health will have several summer programs. Courses in general bacteriology and public health bacteriology, directed by Cecil G. Dunn, '30, Assistant Professor of Industrial Biology, and Dr. John W. Williams, Associate Professor of Public Health Laboratory Methods, will offer special opportunities to public health workers as well as to students, teachers, and technicians in the various fields of public health. The course on general bacteriology will be given from June 10 to 28; that on public health bacteriology, from July 1 to 19. A summer program in public health, school health, and health education, leading to the certificate in public health and covering four years in summer courses, will begin this summer under the direction of Clair E. Turner, '17, Professor of Biology and Public Health. The staff will include Dr. Williams and Murray P. Horwood, '16, Professor of Bacteriology and Municipal Sanitation. The course will be given this year from July 1 to August 21. There will also be a summer program in food technology from July 1 to 19 under the direction of Bernard E. Proctor, '23, Associate Professor of Food Technology. The course will



M.I.T. Photo



G. B. Andrews, '41

meet the demand for advanced knowledge of the basic sciences pertaining to food and the technical processes of its production, manufacture, storage, and distribution.

Frederick H. Norton, '18, Associate Professor of Ceramics, will lead a summer program in ceramic molding processes. This course, sponsored by the Department of Metallurgy, will be held from July 8 to 13 and will consider problems in methods of forming clay wares, a field in which there have been a number of recent developments of special interest. John T. Rule, '21, Chairman of the Section of Engineering Drawing and Descriptive Geometry, will be in charge of a course on graphics for teachers of mechanical drawing, which is to be given from July 8 to August 16. From July 8 to 26, courses in city and regional planning, covering the principles, techniques, legislation, and administration, will be given under the direction of Frederick J. Adams, Chairman of the School of Architecture's Course in City Planning and Housing.

The very successful summer course on principles of textile analysis will be repeated this summer by Edward R. Schwarz, '23, Professor of Textile Technology, from July 22 to August 30. Photoelasticity, a new summer course, will be given from July 22 to August 2 under the direction of William M. Murray, '33, of the Department of Mechanical Engineering. The course is designed to meet the need for instruction in this method of stress analysis and is expected to be of value to industrial research workers interested in the development of photoelasticity laboratories.

Harold A. ~~Ralph E.~~ Freeman, Head of the Department of Economics and Social Science, and George P. Wadsworth, '30, Assistant Professor of Mathematics, will give a joint course on statistical methods from September 4 to 14. Graduate courses in chemistry will be offered from June 10 to August 2. This important program is in the charge of Leicester F. Hamilton, '14, Professor of Analytical Chemistry.

In the Hobby Shop, Ralph B. DeLano, '41, shop foreman this term and expert electrical gadgeteer, at work on the assembling of high speed photolamps for use in photography. Constructed of parts presented by Harold E. Edgerton, '27, the photolamps were used in a high-speed photographic contest which closed on Open House Day and which was open to any student sponsored by a Hobby Shop member. Stanley N. Golembé, '42, has constructed a microphone trip to be used with the lamps. On Open House Day the whole apparatus was used, so that visitors could take high-speed pictures with their own cameras.

Commencement Speakers

JAMES B. CONANT, President of Harvard University, and Henning Webb Prentis, Jr., President of the National Association of Manufacturers, will be the principal speakers at the Institute's commencement week events in June. Professor Ralph G. Hudson, '07, chairman of the Institute's Committee on Commencement, announces that Dr. Conant will deliver the baccalaureate address to the Class of 1940 at services to be held on Sunday afternoon, June 2, in Walker Memorial. Dr. Prentis will make the commencement address at the graduation exercises in Symphony Hall on June 4. He has chosen as his subject "Technically Trained Men in a Republic."

meet the demand for advanced knowledge of the basic sciences pertaining to food and the technical processes of its production, manufacture, storage, and distribution.

Frederick H. Norton, '18, Associate Professor of Ceramics, will lead a summer program in ceramic molding processes. This course, sponsored by the Department of Metallurgy, will be held from July 8 to 13 and will consider problems in methods of forming clay wares, a field in which there have been a number of recent developments of special interest. John T. Rule, '21, Chairman of the Section of Engineering Drawing and Descriptive Geometry, will be in charge of a course on graphics for teachers of mechanical drawing, which is to be given from July 8 to August 16. From July 8 to 26, courses in city and regional planning, covering the principles, techniques, legislation, and administration, will be given under the direction of Frederick J. Adams, Chairman of the School of Architecture's Course in City Planning and Housing.

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Appointments and Retirements

APPOINTMENT of Howard R. Bartlett as professor and head of the Department of English and History, and the retirement of four prominent members of the Faculty — three of whom are members of the Class of 1895 — lead the annual list of staff changes announced at the Institute this spring. Professor Bartlett, a native of Auburn, Maine, was graduated from Dartmouth College in 1923 and was awarded the degree of master of arts from Harvard University in 1929. Following a year as instructor in history at the Haverhill, Mass., High School, he came to the Institute in 1929 as an instructor in the Department of English and History. He was promoted to the rank of assistant professor in 1935, became associate professor in 1938, and has been acting head of his Department since the retirement of the late Professor Henry G. Pearson in 1937.

Careers in teaching and research which total 147 years of service in scientific and engineering education will come to a close with the retirements of James F. Norris next January and those of William T. Hall, '95, Charles W. Berry, '95, and Harold K. Barrows, '95, in June. All of them retire with the rank of professor emeritus. Dr. Norris, who is internationally known for his achievements in chemistry, is professor of organic chemistry. As director of the Research Laboratory of Organic

Chemistry, he has had charge of many important research projects. He has been a member of the staff for thirty-three years, has been active in scientific societies throughout his career, and is a former president of the American Chemical Society. Bowdoin College awarded him the honorary degree of doctor of science in 1929. Two years ago he was a delegate to the International Congress of Chemistry in Rome. He was appointed a member of the Naval Consulting Board in 1916 and was chairman of the division of chemistry and chemical technology of the National Research Council in 1924-1925 and is now a director of the council. Dr. Norris was educated at Johns Hopkins University in his native city of Baltimore, receiving his undergraduate degree in 1892 and his doctorate in philosophy in 1895.

Professor Hall, a member of the staff of the Department of Chemistry for forty-two years, has been popular with hundreds of students, in whose welfare he has always taken a deep interest. After his graduation from the Institute he went to Germany for advanced studies before beginning his notable teaching career at Technology. Professor Berry is well known for his achievements in research, from which have come a number of important developments on testing internal-combustion engines. He is an authority on heat engineering and refrigeration, subjects on which he has written a great deal. He was awarded the Swett Fellowship for study in Germany after his graduation from Technology, and joined the staff of the Department of Mechanical Engineering upon his return in 1899. One of the country's most noted hydraulic engineers, Professor Barrows is widely known for his methods of flood control, a field in which he has been active for many years. In addition to his research and teaching in the Department of Civil Engineering for thirty-one years, he has been a consultant on the design of water-power and water-supply systems throughout the East. He will retire with the rank of honorary lecturer in civil engineering.

Among the new appointments is that of Clarence T. Marsh, Colonel, Coast Artillery Corps, United States Army, who will come to the Institute from duty in Panama to head the Department of Military Science. He relieves Lieutenant Colonel Charles Thomas-Stahle, '22, who will go to Washington. Other appointments are those of Orson Cutler Shepard of Stanford University, who will be visiting associate professor in metallurgy, and Roland D. Parks, an authority on mining economics, who will come from the Michigan College of

These toppling miniature bowling pins were caught by Spencer M. Richardson, '40, shop foreman during the fall term, in one of the first high-speed pictures taken by use of the lamps constructed by students.

Mining and Technology to join the Department of Geology. Professor Lawrence B. Chapman, '10, of the Department of Naval Architecture and Marine Engineering has been appointed to take charge of the course in marine transportation; and Donald P. Severance, '38, has been appointed assistant to the Registrar.

Members of the Faculty promoted to the grade of professor are Raymond D. Douglass, '31, and Dirk J. Struik, Department of Mathematics; Avery A. Morton, '24, Department of Chemistry; Sverre Pettersen, Department of Aeronautical Engineering (Meteorology); and Albert A. Schaefer, Department of Business and Engineering Administration.

Promoted to the rank of associate professor are William P. Allis, '23, Department of Physics; Avery A. Ashdown, '24, Stephen G. Simpson, '16, and Ralph C. Young, '29, Department of Chemistry; Charles H. Blake, '25, Department of Biology and Public Health; Douglass V. Brown and W. Rupert MacLaurin, Department of Economics and Social Science; Samuel H. Caldwell, '25, and Arthur R. von Hippel, Department of Electrical Engineering; John R. Markham, '18, Department of Aeronautical Engineering; and John D. Mitsch, '20, Department of Civil and Sanitary Engineering.

Those members of the staff promoted to the grade of assistant professor are Isadore Amdur and Lawrence J. Heidt, Department of Chemistry; Allan T. Gifford, '27, Department of Civil and Sanitary Engineering; Charles Kingsley, Jr., '27, Department of Electrical Engineering; Richard F. Koch, Department of Modern Languages; Herman P. Meissner, '29, Department of Chemical Engineering; William MacG. Murray, '33, Department of Mechanical Engineering; Augustus R. Rogowski, '28, and John D. Trimmer, Department of Aeronautical Engineering; Reinhardt Schuhmann, Jr., '38, Department of ~~Mining Engineering~~; and Gerald B. Tallman, Department of Business and Engineering Administration.

(Metallurgy)



Promotions to the grade of instructor include those of Edward L. Bartholomew, Jr., '37, Matthijs G. J. Boissevain, '38, Frederick R. Evans, Ascher H. Shapiro, '38, and Malcolm S. Stevens, '34, Department of Mechanical Engineering; Delbar P. Keily, '34, Department of Aeronautical Engineering (Meteorology); and Clark C. Stephenson, Department of Chemistry.

Leaves of absence were granted to Edward E. Bugbee, '00, Associate Professor of Mining Engineering, who has been appointed to an exchange professorship at Stanford University for the next academic year; John L. Reid, '31, Associate Professor of Architecture, who will go to California for a year of professional practice; and Olin Ingraham, Assistant Professor of Economics.

Corporation Appointments

JOHN R. MACOMBER, '97, chairman of the board of the First Boston Corporation, has been appointed to the executive committee of the Corporation of the Institute. Mr. Macomber, who has been a life member of the Corporation since 1931, succeeds the late Philip Stockton, '99, on the executive committee and has been chosen to act as chairman of its finance committee.

Marshall B. Dalton, '15, an alumni term member of the Corporation, has been elected to the finance committee. Mr. Dalton is president of the Boston Manufacturers Mutual Fire Insurance Company and the Paper Mill Mutual Insurance Company and is a former president of the Alumni Association of the M.I.T.

Architectural Prizes

TECHNOLOGY men — graduates and students — won fourteen of the thirty-seven prizes awarded in architectural competitions sponsored by the Owens-Illinois Glass Company. These competitions, open to all architects in the United States, were based on four design problems incorporating the use of glass building blocks in a modern house, in the remodeling of a business block, in a dairy, and in a newspaper plant. For each competition eight awards were given: a first prize of \$1,000, a second of \$750, a third of \$250, and five prizes of \$100 each. In addition, there were grand prizes, awarded on a scored-point system, in the following amounts: first grand prize, \$1,500; second grand prize, \$1,250; third grand prize, \$1,000; fourth grand prize, \$750; and fifth grand prize, \$500.

The first competition, the design of a modern house, was won by Harris A. Kemp, who received the degree of master in architecture at the Institute in 1937. Third prize was given to William V. Kaeser, who was awarded the master of science degree at Technology in 1932.

Fourth and fifth prizes in the second competition, the remodeling of a business block, were won, respectively, by M. Righton Swicegood and the two-man team of Bissell Alderman, '35, and Gilbert E. Hoffman. Swicegood was awarded the degree of master of science in 1931. Alderman, who already had many architectural honors to his credit, received his degree of master in architecture from the Institute in 1937 and is now an instructor at the University of Washington. Hoffman holds the degree of master in architecture, which he

was awarded by M.I.T. in 1939. He is now on the staff of the Oklahoma Agricultural and Mechanical College.

The competition for the design of a dairy with a milk bar was won by Ernest A. Grunsfeld, Jr., '18, in collaboration with two partners who are not Technology men. Mr. Grunsfeld, who studied in Paris and Rome after leaving the Institute, already had several medals and prizes to his credit. Mr. Kemp, winner of the competition for the design of a modern house, was given second prize for his dairy, and third prize went to M. Wayne Stoffle and Robert A. Deshon, who are now working for their masters' degrees in the Institute's School of Architecture. The sixth prize in this competition was also awarded to two graduate students at Technology: Francis R. Meisch and Keith I. Hibner.

In the fourth and final competition, the design of a modern newspaper building, Technology men were awarded four of the eight prizes. Mr. Kemp, adding to the laurels he had already accumulated, won first grand prize for his design of a newspaper plant. Second grand prize, as well as second prize, was won by Messrs. Stoffle and Deshon, who were winners of third prize in the dairy problem. Fourth grand prize, as well as third prize in the competition, went to Messrs. Meisch and Hibner to add to their honors as winners of the sixth prize in the dairy competition. Fifth prize for design of the newspaper plant was awarded to B. Leonard Krause, '39, who is now carrying on graduate work in the School of Architecture.

Participation in these competitions required a thorough study of all the practical problems presented in the various types of buildings, giving due consideration to a proper and practical use of the products of the manufacturers who sponsored the competitions. The results are an indication of the thoroughness with which architectural problems are studied at the Institute and confirmation of the fact that a sound and continuing policy of a well-rounded curriculum prepares architects to meet such problems successfully.

Alumni Teachers

THE colloquium as a teaching technique offers many advantages, not the least of which is the fact that it brings back to the Institute Alumni who have distinguished themselves in industry and who can speak with authority as well as reckon with the point of view of the students attending the sessions. Recent colloquia in the Department of Electrical Engineering were led by J. P. Maxfield, '10, director of commercial engineering, Electrical Research Products, Inc., and Joseph H. Cox, '23, of the transportation and generator department, Westinghouse Electric and Manufacturing Company.

Acoustical problems involved in sound recording and reproduction and their relation to general auditorium acoustics were the subject of Mr. Maxfield's meetings. After teaching physics and electrochemistry four years at the Institute, Mr. Maxfield joined the Bell System in 1914 and, except for three years as manager of engineering and research at the Victor Talking Machine Company, he has been with the system continuously. Under his supervision electrical disk recording was



From Room 6-340 in the Eastman Building, at half past nine in the evening, the dormitories played electric sign for the benefit of a "Technique" photographer.

developed and perfected — work which opened up the fields of orthophonic recording and talking motion pictures.

Since 1929 he has been with Electrical Research Products, Inc., a subsidiary of the Bell System's Western Electric Company, Inc. For several years he has applied his knowledge to the art of recording and reproducing sound for motion pictures, thereby helping to bring it to the present stage of perfection, and he has spent considerable time in studios and theaters throughout the United States in connection with this work. As director of commercial engineering, Mr. Maxfield makes available to others the results of Bell Laboratories research. He is a fellow of the American Institute of Electrical Engineers, the American Physical Society, the Acoustical Society of America, and the American Geographic Society.

Mr. Cox, who led a colloquium on ignitron rectifiers, was enrolled in the State Normal School of Wayne, Neb., when the United States entered the World War. He joined the Navy, trained at the Naval Academy, and served aboard the U.S.S. *Mississippi* and the U.S.S. *Seneca*. He resigned as lieutenant, junior grade, from the Navy in September, 1919, and is now a lieutenant, senior grade, in the Naval Reserve. He returned to the Wayne State Normal School before entering the Institute, from which he was graduated in 1923 with a bachelor of science degree.

Immediately thereafter, Mr. Cox became connected with the Westinghouse Electric and Manufacturing Company and was employed in the New York service department from July, 1923, to April, 1924. He was in charge of surge investigations on transmission lines in the transmission engineering department under the late Charles LeG. Fortesque from April, 1924, to October, 1929. Since that time he has been associated with the development and production of rectifiers.

Christenings

CLOSE on the heels of the naming of Huntington Hall and the Pierce Engineering Laboratory, announced here last month, comes the word that numerous rooms in Walker Memorial have been given new nomenclature. The main dining hall has become Everett Morss Hall. Mr. Morss, who died in 1933, was graduated from the Institute in 1885 and in 1921 became its treasurer, a post in which for many years he worked for the interests of Technology and of its student body. He donated the funds which made possible the painting of the Blashfield Murals in the hall which now bears his name, and he was influential in providing Walker Memorial as a student recreation center.

North Hall will henceforth be called Pritchett Hall in honor of Henry S. Pritchett, President of Technology from 1900 to 1907. As a part of his plan to bring student and alumni events onto the campus, minimizing formality and thus increasing attendance, Dr. Pritchett originated the idea of having a dining hall where such functions could be held.

It was thought best to maintain for the upper west lounge the name Faculty Lounge, since this is descriptive of the purpose which the room serves. The upper east lounge, long known as the Cilley Library after Frank Harvey Cilley, '89, who provided funds for its establishment, has now been officially so designated. The lower west lounge has been named the Tyler Lounge in honor of the memory of H. W. Tyler, '84, for many years Secretary of the Faculty and Head of the Department of Mathematics. He also served as chairman of the building committee of Walker Memorial. Litchfield Lounge is the new designation of the lower east lounge, named for Isaac W. Litchfield, '85. Loyal Alumnus and former Managing Editor of The Review,

he played an important part in raising the funds for construction of Walker Memorial, named for Technology's third President, Francis Amasa Walker.

These new names were selected by the Alumni Association's Committee on Historical Collections and were put into effect after concurrence by the Institute Committee. The Association's committee includes H. B. Richmond, '14, chairman, Henry D. Jackson, '95, Arthur L. Townsend, '13, Avery A. Ashdown, '24, and Robert P. Bigelow.

This seems an appropriate time to recall other Technology buildings which are named for men who, as benefactors or as officers of the Institute, contributed importantly to its advancement. Among them are the George Eastman Research Laboratories of Physics and Chemistry, made possible by the generosity of George Eastman; the Richard Homberg Memorial Infirmary, built by the family of Richard Homberg, '23, who died while a student; and the Sloan Automotive Laboratory, established by the generosity of Alfred P. Sloan, Jr., '95.

The Institute's dormitory units are named for Silas W. Holman, '76, Professor of Physics, who was a member of the Institute's staff from 1876 to 1900; ~~Riley~~ ^{W.H. (1914)} ~~President~~ ^{Professor} ~~1871 to 1876~~ ^{1921 to 1922} ~~President~~ ^{1921 to 1922}; James Mason Crafts, Professor of Chemistry, 1870 to 1880, 1892 to 1897, and President, 1897 to 1900; William R. Ware, Professor of Architecture, 1865 to 1881, who led in the establishment of the Institute's School of Architecture; William P. Atkinson, Professor of English, 1865 to 1890, Secretary of the Institute, 1865 to 1868, and Librarian, 1866 to 1868; John D. Runkle, Professor of Mathematics, 1865 to 1902, and President, 1870 to 1878; James P. Munroe, '82, Secretary of the Corporation, 1907 to 1929; Charles Hayden, '90, member of the Corporation, 1913 to 1937; Kenneth F. Wood, '94; Charles W. Goodale, '75; A. Farwell Bemis, '93, member of the Corporation, 1914 to 1936; and William W. Walcott, '01. In addition there are the field houses which bear the names of Frank Harrison Briggs, '81, and Edmund Dana Barbour. The courts enclosed by the educational buildings are named for Mr. Eastman; Coleman du Pont, '84, member of the Corporation, 1906 to 1930; and Augustus Lowell, member of the Corporation, 1873 to 1900.

Analgesic

GRADUATES who suffer periodically from nostalgic pains for the "Boston Tech" that is no more, the Tech on Boylston Street, may gain some comfort from an occasional look at a 20-foot section of wrought-iron fence which has been set up in the first-floor exhibition room of the new Rogers Building. Here the fence has gained permanent sanctuary from obliteration by wreckers, to become one of the few remaining mementos of Technology's vigorous adolescence. For it, thanks are due the thoughtfulness and hardihood of a Technology woman, Mrs. Marion Lewis Lee, '96, who applied to the wrecking company for the fence and had it transported to Cambridge. Until last summer it guarded the Newbury Street entrance of the old Walker Building, more recently the headquarters of the Boston University School of Business Administration.

FIREWORKS FOR FUN

(Continued from page 275)

are built like rockets, except that the conical depression where the burning commences is not nearly so deep, and they are choked with perforated plugs of clay. Coarse charcoal, steel filings, and sometimes other substances, such as realgar or granulated aluminum, are incorporated in the driver composition to produce various effects. Drivers attached to the periphery of a wheel or to the sides of a square or triangle which is pivoted at its center cause the device to rotate in reaction to the rapid stream of fire which they eject. They are used in Catherine wheels and in such larger pieces as the "Revolving Cascade," "Dragon Wheel," "Wheel of Fortune," "Chromatic Circle," "Brilliant Sunrise," and "Morning-Glory."

After the time of Hanzelet Lorrain no important improvements were made in the pyrotechnic art for about two centuries. Soon after 1800, strontium and barium nitrates — for red and green flames, respectively — began to be used in colored-fire compositions in place of part or all of the saltpeter which was the usual oxidizing agent. About 1830, potassium chlorate began to be used. This powerful but dangerous oxidizing agent produced brighter flames and led to a study of the effects of mineral salts of all sorts in pyrotechnic compositions and to the development of a great variety of colors. The study culminated in the work of Tessier, whose *Chimie Pyrotechnique ou Traité Pratique des Feux Colorés* (Paris, first edition, 1859; second edition, 1883) remains the best book on the subject. Tessier also studied the picrates and developed compositions containing ammonium picrate, "tableaux lights," which gave but little smoke and were useful in the theater but have now been replaced entirely for that purpose by electric lighting. Chlorate mixtures which contain sulphur give brighter flames than those which lack it, and such mixtures are still used occasionally in spite of their easy inflammability and dangerous sensitivity to shock. The present tendency, however, is toward chlorate mixtures which contain no sulphur, or toward potassium nitrate mixtures which contain sulphur but no chlorate, or toward nitrates — such as those of strontium and barium — which supply both color for the flame and oxygen for the combustion. The less dangerous potassium perchlorate is coming into use as a substitute for chlorate. Magnesium was first used in fireworks about 1865 and aluminum about 1894, each of them for the production of a dazzling white light. Magnesium is oxidized fairly rapidly by moisture — much more rapidly than aluminum, by which it has been largely superseded for use in commercial compositions. Powdered magnesium, however, may be used satisfactorily if the particles have first been covered with a film of linseed oil.

The airplane wing-tip flares which were used for signaling during the World War are good examples of aluminum compositions. They were loaded in cylindrical pasteboard cases four and a quarter inches in length and one and five-eighths in internal diameter. The white-light composition consisted of 77 parts of barium nitrate, 13 parts of flake aluminum, and 5 parts of sulphur intimately mixed and secured by a binder of shellac, and



Courtesy of Wallace Clark

Making Chinese firecrackers into bunches by braiding the fuses together, French Indo-China, January, 1939

burned, in the cases previously mentioned, for one minute with an illumination of 22,000 candle power. The red light was made from 24 parts of strontium nitrate, 6 parts of flake aluminum, and 6 parts of sulphur with a shellac binder, and burned for one minute with an illumination of 12,000 to 15,000 candle power.¹ Thus fireworks, intrinsically for pleasure and benefit, are turned to purposes of war, as so many benevolent and valuable things — men, food, paper and ink, human ingenuity, and high ideals — are likewise uselessly perverted.

Fireworks are for fun. The fireworks enthusiast loves to see them, to talk about them, to visualize them in retrospect; from fireworks catalogues he gets the same pleasure that the gardener gets from the seed catalogues which act so powerfully upon his imagination. Such passages as these quoted from current catalogues are representative of the descriptions which delight him:

“Sheba’s Brooch Set Piece. When this device breaks open, brilliant and sparkling golden and diamond effects are reproduced in one of Sheba’s beautiful and costly brooches. This comes in mammoth size and is one of the devices that will bring applause.”²

“Victor Jerome Battle in the Clouds Shell. A spectacular 12-inch battle shell that opens with showers of signal lights, followed by six precision-timed heavy battle reports, and a seventh and final detonation of terrific force, bringing the exhibition to an end with a mighty bang.”³

¹H. B. Faber, *Military Pyrotechnics* (Washington: Government Printing Office, 1919), II, 223, 225-226.

² Illinois Fireworks Company, Inc., *Catalogue*, 1939.

³ Liberty Display Fireworks Company, Inc., *Catalogue*, 1939.

LOW-COST SHELTER

(Continued from page 278)

development of most of the articles in common use today has been that a reduction in cost and an increase in the quality of the product have created a very much wider use. Housing is made up of so many divergent materials, manufactured and sold by so many unrelated elements, that up to the present the problem has not been attacked on this basis. Manufacturers should be asked to study the question of production of these items at a given cost the sum total of which will produce a home within the reach of hundreds of thousands of citizens now unable to own one. This would release all of the funds now used for subsidy of those who should not be subsidized, enabling the money to be diverted to the lowest-income groups, who are still ill housed and who will continue to be until government and capital and labor set about to clean house in the building industry, attacking the problem co-operatively and intelligently.

Aside from the cost of construction with all its ramifications, the high cost of land, financing difficulties, taxation policy, zoning abuses, and mistaken building codes are hindering the development of low-cost shelter. These are the five points which must be attacked directly.

Land in our cities has reached a cost per square foot entirely out of line with the land’s value. This fact is more particularly noticeable in housing because of the desire to reduce the density per acre. When land costs from forty to sixty thousand dollars per acre in the slum areas of our cities, a reduction in the density to a desirable point means an increase in the cost of rental. Some program looking to the eventual elimination of much of this unjustified cost must be undertaken; a principle of taxation in accordance with the use value of the land seems a goal toward which to work.

Financing occasions one of the major costs to the home builder. Much has been done already to outlaw some of the unfair charges made to the owner for refinancing mortgages. The cost of financing the small home is, however, still a problem for consideration. This subject is outside the functions of the architect, but it is a problem which he should call to the attention of the proper groups as one of the difficulties he encounters in his housing developments. Is it fair to attempt to secure from loans on housing a revenue greater than the average income from market securities? A high interest rate on a loan or a house is more likely to create an unsound financial picture than a lower interest rate would produce.

Current taxation of real estate is a matter receiving the attention of property owners and also of city governments. It is charged that methods of real estate taxation have been one of the reasons for creating false values. Out of this situation has come deterioration of properties, caused by the lack of funds for keeping them up and resulting in the decay of real property in the centers of our cities, with a consequent falling off in the revenues from taxation. Though this decay has often been a blessing in disguise, since it has forced many a city government to cut down disbursements, there will be a limit to

economies which can be made without dispensing with necessary government functions. Therefore, the question of property taxation with respect to those things from which city revenue may be expected is a matter of prime importance in the reconstruction of our country.

Most zoning ordinances are improperly drawn and based on unsound principles. Political expediency has cropped out often because many property owners, under the impression that their property, if zoned for business, would be thrown into a prospectively higher-priced market, have used political pressure to have their land so rezoned. In some cities, street frontage zoned for business purposes is from two to four times what would probably ever be needed for business. The result has been a stagnation in the market. The property owner's greed has actually further contributed to his property's delinquency from a tax standpoint. Zoning ordinances should be thoroughly re-examined and rewritten, and this revision should be made in conjunction with building-code studies.

The building codes of the United States, obsolete and unscientific, constitute an infringement of the rights of the building public because they attempt to make mandatory the use of certain types of construction and materials which, while good in themselves, are unnecessary to the erection of safe and sanitary buildings. Code restrictions on building should be based on the police power, which has the right to regulate only for safety and health. All other regulations should be recommended practice, to be used by the owners, their architects, and their engineers at their discretion. An examination of building codes points to the conclusion that a radical and sane reduction in the requirements of these codes under police-power regulations will lower the cost of housing by approximately 20 per cent.

The construction of buildings is further hampered by unnecessarily high standards in government regulations, which, because they control the plan and construction of low-rental slum-clearance housing, are keeping costs up. Entirely too elaborate, all inclusive, and far reaching, the regulations strangle ingenuity in planning and design, and thwart the use of new materials, apparatus, and types of construction. They should be abandoned, and the ingenuity of the architectural and engineering professions should be directed to the cost problem. The architect should play a large part in the reduction of costs by devising simple and ingenious plans which will provide safe, sanitary, and comfortable living conditions in a cubage very much less than that existing in the present program. Thus he may contribute greatly to success in housing. One of the best examples of ingenuity in planning is a Pullman car.

It is not necessary to go into the details of the restrictions which capital and labor are imposing on the housing program. The current investigation by Thurman Arnold, assistant attorney general of the United States, and the indictments which have resulted are ample evidence that there is much unjustifiable restriction in the building industry. Such restrictions, which are generally termed "rackets," are usually accomplished by a minority who have secured control for selfish purposes. These rackets must be eliminated for the good of capital, labor, and the prospective home owner.

Perhaps the type of strike which is most prejudicial to the interests of the home owner is the jurisdictional dispute, because here neither the owner nor the contractor is a party; both are the helpless victims of a question of jurisdiction which arises between two rival trade unions. Intelligent labor leadership is fully aware of this serious condition and is moving against it. As a matter of fact, all strikes could be eliminated with a very great advantage to everyone concerned. One progressive labor leader has made the statement that he has never been the cause of a single mechanic's losing a day's pay because of a strike; his comment was that he could fight just as well when his men were working as when they were loafing! No matter what the dispute, the men with the tools never make up for the losses that come to them in idleness. In the low-cost housing field the number of trade unions should be cut, perhaps to only one.

A number of indictments have been made charging collusive bidding among contractors and collusion between contractors and labor. These fraudulent practices likewise serve the selfish purposes of a few and, as is true of some indictments recently returned, favor a few contractors on a labor rate differential. The burden is thus placed on those contractors outside the organization, who are generally the ones doing the small-house work, which again throws the burden on the small-home owner. Democracy has no place for such rackets.

A great many manufacturers have raised the question of a restudy of the methods of distribution, especially in the low-cost housing field. Certainly when two middlemen are operating, it frequently seems unfair that the home builder — who is struggling to create an equity in a home — should be forced to pay both. On large-scale housing for low-income workers, it seems reasonable to ask industry to consider direct delivery to the job or, when a local representative is needed, a minimum charge for handling. Similarly, many patents which would contribute greatly to the reduction of costs, to the improvement of methods of construction, and to the availability of new types of equipment should be released for the benefit of the building public. Moreover, since prefabrication in whole or in part is necessary to the production of houses to be purchased by or rented to low-income groups, neither capital nor labor should stand in the way of its adoption.

MANIPULATING THE MICROWAVES

(Continued from page 281)

(receiving technique is still literally in the crystal-detector stage), this work, it is expected, will be of general value.

Frequency modulation, which is creating a nation-wide stir in broadcasting, promises unusual things in micro-wavelengths as well. It is being studied in a co-operative thesis project. A receiver suitable for airplane use and a low-powered transmitter are being constructed, and their early application to radio marker beacons is proposed. A marker beacon is a signal vertically erected to mark the position of an airport, mountain, or other landmark. Markers of improved sharpness and increased range are becoming more necessary as navigation becomes increasingly precise and *(Continued on page 294)*

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MANIPULATING THE MICROWAVES

(Continued from page 292)

as aviators take to the stratosphere. Since frequency modulation may supply a greater range with the same transmitter power, it is particularly adapted to meet these needs. Microwaves and horn radiation are ideally suited to the production of sharper signals, as they demonstrated in the instrument landing study. The detailed problems of design and construction of horns for use in markers are being studied now. This versatile new antenna, it is expected, will produce almost any conceivable shape of marker signal — a thing hitherto impossible.

Fundamental insight into the behavior of dielectrics at ultrahigh frequencies is being sought in the insulation research described earlier in The Review, which constitutes an important phase of the general microwave program. Dielectrics may possibly be applicable as useful high-frequency elements in ways having little or nothing to do with insulation. It seems, for example, that the proper application and grading of dielectric materials should give means for the selection of waves, and for governing transmission and reflection in ways hitherto not utilized. New and useful ultrahigh-frequency circuit elements may thus be devised.

The delicacy of the problems encountered here may be surmised from the fact that the microwaves resemble light waves and are governed by the same factors, being bent and dispersed, reflected and diffracted, by obstacles. By the same token, however, since the wavelength has shrunk so far when the ultrahigh frequencies are reached, the optical aspect of the phenomena involved comes to deserve far more emphasis than it has received, and may permit of new methods of control. The intelligent application of interference phenomena might, for example, allow a new control of transmission and reflection in exactly the same manner as it has been achieved for visible light in the production of "invisible" glass in the Institute's physics laboratories. The construction of dielectric wave filters and the development of a new technique for measuring the electromagnetic field and the properties of dielectrics, moreover, may be possible. The method of measuring impedance of hollow-pipe terminations which has been mentioned has been developed into an effective means for the experimental investigation of dielectric materials at ultrahigh frequencies.

It is natural enough to ask what specific application can be foreseen for the more accurately measurable and more precisely controllable microwaves that should result from all this study. Apart from their highly important application in the C.A.A.-M.I.T. instrument



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landing system and the spectacular possibilities of their use to convey enormous blocks of intelligence through hollow-pipe conveyors, several specific objectives for them are being investigated at present.

The first of these hinges upon the fact that at wavelengths of five meters or less, radio waves are not refracted and consequently turned back to earth by the strata of ionized gases in the ionosphere, known as the Kennelly-Heaviside layer. Constant transmission at these wavelengths is limited to optical paths. Though they are not refracted by the Kennelly-Heaviside layer, microwaves are refracted and reflected in the lower atmosphere in a manner not clearly understood at present. Because of decreasing atmospheric density with increasing altitude, the dielectric constant of the atmosphere changes sufficiently to refract the waves and to result in transmission beyond the horizon. Yet this phenomenon alone is not sufficient to account for the long-distance transmission and fading which are frequently observed. Explanation of this paradox is being sought in one of the sponsored projects of the general program. The answer may be expected to yield practical results in the application of microwaves in point-to-point communication and, in addition, to make possible the study of meteorological phenomena, even to the extent of aiding in weather forecasting.

A 40-centimeter transmitter of the klystron type, utilizing an electromagnetic horn, will soon be in operation on the roof of the Institute, radiating about 100 watts of power in a directed beam from a 16-foot horn. Plans are made for a similar station to be established at the laboratories of Alfred L. Loomis at Tuxedo Park, N. Y.; and along the line joining these two points, running approximately through Hartford, Conn., receiving equipment provided with automatic recorders for registering signal intensity will be set up at suitable intervals. The number of intermediate stations will be determined by the signal range — a quantity as yet practically unknown. Similar links on short wavelengths are to be set up as soon as possible; transmitters of the same type, operating at 10 centimeters and generating 10 or 20 watts, will be available shortly.

By locating receivers at known distances from the transmitters and by varying the angle of inclination of the beam to the earth, an estimate of the height of air-mass boundaries and regions of turbulence can be obtained, since ultrashort waves are partially reflected from these regions where the dielectric constant changes very rapidly. Comparison of (*Concluded on page 296*)

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MANIPULATING THE MICROWAVES

(Concluded from page 295)

these results with meteorological data from other sources may contribute to a better understanding of the mechanism of wave propagation and possibly to earlier prediction of the future state of the weather.

Another stimulating possibility is the utilization of microwaves in the "radio bounce" technique to assist the surveyor and the navigator. Albert Michelson, who devoted much of his life to measuring the speed of light, envisioned a method of surveying that would interpret a terrestrial distance in terms of the time occupied by a light beam in traversing it. Experimentation began several years ago at Technology with the substitution of radio waves for light waves for this purpose. Apparatus was arranged to transmit radio waves less than ten meters long to a distant point from which they were returned to the original point, there to be compared with outgoing waves. Determination of the number of waves extending between the two points and hence of the distance separating the two points was thus made possible.

The success of these methods working over short distances — even though waves of the length at first used are not easily concentrated into beams and reflected from metallic mirrors of reasonable sizes — showed the real value of improving them for use not only in surveying but also in the navigation of aircraft and of ships at sea. Much shorter wavelengths, approaching in ease of manipulation the definiteness of light beams and yet retaining the ability of radio waves to penetrate great depths of fog, rain, and snow, will prove of the greatest utility. Apparatus using waves of the order of one meter in length is at present being devised.

FRICITION, FUZZ, AND HAIR OIL

(Continued from page 284)

should be of different material to prevent adhesion. That is not enough: It should also have high thermal conductivity; with its backing it should be able to support the load adequately and resist scoring and wear; and it should be plastic enough to take on a surface geometry conformable to the shaft or rider. This is indeed much to ask. The usual bearing alloys employed are low melting point alloys of the white metals. Some are even coated, in extreme instances, with flash platings of silver or with an icing of indium. Another type of bearing is of bronze with lead or graphite unalloyed yet finely dispersed throughout the alloy.

Some heavy-duty engines cannot use bronze as a bearing material in their main bearings. They therefore use bronze or copper with lead dispersed but unalloyed throughout the matrix; however, pure lead will corrode with some lubricants. To halt this danger, tin is added to the lead. But in melting, the tin goes into solution in the copper; hence copper grids of some 10 to 60 mesh are soldered to the bearing wall and a 95:5 lead-tin alloy is poured into the interstices. Thus a good thermal conductor, strong antifriction and anticorrosion member is achieved. Others have had more luck in high-speed engines by using a steel backing for an extremely thin

layer of babbitt. Unless extreme care is taken in manufacture, fatigue cracks can develop in this bearing, a difficulty which is worse than the troubles already listed. To a large degree the limit to the life and performance of high-output airplane engines is due to the bearings. Porous bronze with or without graphite is employed to maintain an oil supply for difficult and inaccessible lubricating conditions. Where shafts or riders slide on cast iron, the graphite of the latter lowers the coefficient of friction.

An inspection of run-in bearings, made by microscope and electron diffraction, should alter the oversimplified view common to most metallurgical textbooks on bearing alloys. The bearing and the shaft do not act alone; their surfaces are usually contaminated by some film. Such films, if they remain in place, may (as pointed out before) reduce the coefficient of friction for cases of boundary lubrication, prevent rupture, and thus prevent wear, scoring, or seizure of the mating surfaces. Sometimes the lubricant and, especially, additives which may aid lubrication at high pressures and temperatures may corrode the shaft and bearing surfaces and thus accelerate wear.

Many oils used for lubrication differ but little save in addition agents or contaminations. Minute amounts of fatty acids, metallic soaps, sulphur, graphite, organic compounds of lead, chlorine, arsenic, and phosphorus are to be found alone or in combination, depending on who markets the oil and for what installation it is to be used. The kinks to be straightened determine the hair oil to be employed. Oil companies have carried out a lot of careful research — in their own, as well as academic, laboratories — on fluid, as well as boundary, lubrication and on the attendant phenomena of wear and seizure. Lubricants containing long-chain polar compounds which are adsorbed and oriented in tenacious films on the bearing surface reduce the coefficient of kinetic friction. Oils whose constituent molecules are not preferentially adsorbed in an oriented manner give higher coefficients of friction for rubbing surfaces. Although in straight boundary lubrication such films may give a direct protection to the surface, the mechanism is prob-

ably different in the transition from fluid lubrication — for example, in an engine slowing down. Some research workers incline to the belief that in such instances oriented molecules permit a wedging effect and thus a state of quasi-fluid rather than boundary lubrication.

In engines under high load, temperature flashes may occur at isolated spots of bearings, leading to wear and even to breakdown. The result of the addition of wear-prevention agents is not always to coat all such spots with a compound which may be preferentially adsorbed and so prevent seizure but is actually to form a chemical compound or deposit of lower melting point. Thus high points are melted away and a surface of great smoothness is obtained. The oil companies, as well as most designing engineers, believe that a perfectly fitting shaft and bearing with an extra-smooth surface can be supported more easily by a thin film of oil. Since most shaft and bearing metal assemblies — no matter how perfectly finished — have a somewhat different macro-alignment in the assembled automobile, a running-in period is required. Perhaps the use of more corrosive oils in this stage only may be of advantage in achieving ideal surface conditions for smooth running. Variations of this idea are already used.

Laboratory friction tests with or without oil are generally viewed with suspicion by the practical engineer but even more so are laboratory wear tests. The nearest we can come to a decent test is to simulate service conditions. Wear may be due to abrasion, corrosion, cutting, or frictional failure (seizing or galling) or some combination of these factors. These are in turn influenced not only by the chemical composition of oil and metal at any one time but also by their whole prehistory. Thus where friction between two surfaces is of a rolling nature, pitting may occur because of overstressing of the rubbing materials with cracks starting from within and extended by corrosion from the oil. If sliding is combined with rolling in boundary lubrication, wear may occur by a flaking of the surface. Unless the lubricant removes such products of wear, abrasion will accelerate the process. It should be evident from what has been written that there are many aspects to the (Concluded on page 298)

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FRICITION, FUZZ, AND HAIR OIL

(Concluded from page 297)

problem of boundary lubrication. Teamwork between the various pure and applied scientists in the field is necessary. The Lubrication Laboratory in the Mechanical Engineering Department at M.I.T. provides many examples of it. Shaft surfaces there have been run in and are ready for electron-diffraction studies to determine whether the effect is but a geometrical type of finishing or whether it affects the metal chemically and structurally as well. Curves have been determined to show the functional relationship between coefficient of friction and the Sommerfeld variable $\frac{ZN}{P}$, where Z is the viscosity, N the speed of the machine, and P the pressure on the bearing.

These results clearly bear out the fact that the smoother the surface of the shaft is, the more difficult it is to go from fluid to boundary lubrication and then to seizure. Wear data have been established through extremely fine methods of chemical analysis to determine certain attributes of the phenomenon of running in. A machine has been constructed to measure coefficients of friction at extremely low speeds, using electronic apparatus not sensitive to the relaxation oscillations of the kind which made Bowden's results questionable. Next to it stands a pendulum device with self-recording equipment; from the damping effect of friction on the amplitude of the pendulum, coefficients of friction for different mating surfaces, for different surface finishes, and for different lubricants are determined. On a near-by table is another instrument built by a mechanical engineer who believes that for production all profile-measuring devices now used in industry are entirely inadequate.

He has built an automatic apparatus which tells him how soon and under what speed and load an oil film will break through. In adjacent laboratories fatigue and wear experiments are being carried out — all to do with friction, fuzz, and hair oil. The conference on friction, surface finish, and lubrication to be held June 5 to 7, inclusive, at the Institute will bring an array of prominent speakers and guests — scientists, engineers, producers, and users — to review the store of knowledge in this wide field and project new work that needs to be done.

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★ When you receive your final notice and application form this month, please return it promptly. Both the luncheon and the banquet last year drew unexpectedly large attendance, and this year the committee wishes, by adequate advance information, to be prepared for those who reply early.

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<i>Comparative Standing</i> (based on February '40 ratings)		<i>Increase</i> over June '39	<i>Increase</i> over Feb. '39
Fraternity Seniors	3.43	*0.06	0.01
Dormitory Seniors	3.49	*0.11	*0.05
Fraternity Juniors	3.20	*0.05	*0.06
Dormitory Juniors	3.37	*0.06	0.01
Fraternity Sophomores	3.17	*0.03	0.04
Dormitory Sophomores	3.25	*0.07	*0.07
Fraternity Freshmen	3.09	0.08	0.15
Dormitory Freshmen	3.07	*0.11	*0.08
General Average (Fraternity)	3.21	*0.02	0.04
General Average (Dormitory)	3.30	*0.05	*0.04

FRATERNITY SCHOLASTIC STANDINGS

Comparative Standing of 23 Chapters (based on February '40 ratings)			Increase over June '39	Increase over Feb. '39	Comparative Standing of 23 Chapters over previous five-year period	Comparative Standing of Freshmen of 23 Chapters	Rating Feb. '40	Comparison with Chapter Rating
1. Sigma Alpha Mu.....	3.51		0.19	0.37	1. Phi Beta Delta	1. Phi Delta Theta.....	3.60	+0.27
2. Phi Sigma Kappa.....	3.38		0.12	0.303	2. Sigma Alpha Mu	2. Phi Sigma Kappa.....	3.52	+0.14
3. Alpha Tau Omega.....	3.35		*0.01	*0.018	3. Theta Delta Chi	3. Lambda Chi Alpha.....	3.51	+0.328
4. Theta Chi.....	3.34		0.354	0.12	4. Kappa Sigma	4. Sigma Nu.....	3.47	+0.237
5. Phi Delta Theta.....	3.33		0.12	0.338	5. Phi Gamma Delta	5. Alpha Tau Omega.....	3.43	+0.08
6. Delta Upsilon.....	3.325		0.095	0.334	6. Phi Delta Theta	6. Sigma Alpha Mu.....	3.38	-0.13
7. Sigma Chi.....	3.31		0.13	0.11	7. Phi Kappa Sigma	7. Sigma Chi.....	3.28	-0.03
8. { Kappa Sigma.....	3.30		*0.13	*0.16	8. Beta Theta Pi	8. Sigma Alpha Epsilon.....	3.19	-0.06
Phi Kappa Sigma.....	3.30		0.08	*0.04	9. Delta Psi	9. Beta Theta Pi.....	3.17	-0.05
9. Phi Gamma Delta.....	3.26		*0.144	*0.107				
GENERAL AVERAGE ALL UNDERGRADUATES			3.25	*0.05	0.01			
10. Sigma Alpha Epsilon..	3.25		0.15	0.17	10. Delta Upsilon	10. Phi Beta Epsilon.....	3.15	+0.05
11. Sigma Nu.....	3.233		0.063	0.001	11. Chi Phi	11. Theta Chi.....	3.11	-0.22
12. Delta Kappa Epsilon..	3.23		0.232	0.34	12. Phi Beta Epsilon	12. Delta Tau Delta.....	3.08	-0.12
13. Beta Theta Pi.....	3.22		0.097	*0.01	13. Phi Sigma Kappa	13. Delta Kappa Epsilon.....	3.03	-0.20
AVERAGE ALL FRATERNITY MEN.....			3.21	*0.02	0.04			
14. Delta Tau Delta.....	3.20		0.09	0.22	14. Phi Mu Delta	14. Kappa Sigma.....	3.02	-0.28
15. Lambda Chi Alpha....	3.182		0.057	0.222	15. Sigma Alpha Epsilon	15. Delta Upsilon.....	2.97	-0.355
16. Phi Beta Delta.....	3.18		*0.32	*0.30	16. Delta Tau Delta	16. Theta Delta Chi.....	2.91	-0.03
17. Phi Beta Epsilon.....	3.10		*0.332	0.01	17. Sigma Nu	17. Phi Mu Delta.....	2.88	-0.09
18. Theta Xi.....	2.99		*0.137	0.33	18. Alpha Tau Omega	18. Theta Xi.....	2.82	-0.17
19. Phi Mu Delta.....	2.97		*0.02	*0.19	19. Sigma Chi	19. Phi Beta Delta.....	2.81	-0.37
20. Theta Delta Chi.....	2.94		*0.21	*0.42	20. Theta Xi	20. Phi Kappa Sigma.....	2.79	-0.51
21. Delta Psi.....	2.91		*0.48	*0.25	21. Delta Kappa Epsilon	21. Delta Psi.....	2.70	-0.21
22. Chi Phi.....	2.90		*0.32	*0.274	22. Lambda Chi Alpha	22. Phi Gamma Delta.....	2.50	-0.76
					23. Theta Chi	23. Chi Phi.....	2.45	-0.45

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NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

Technology Club of Chicago

The Club's third annual meeting at which Dr. Compton could be with us took place on March 21. Our other honored guest this year was Frank B. Jewett '03, President of the M.I.T. Alumni Association. The meeting — held at the Hotel Sherman — started at six-fifteen with a reception in the House on the Roof. It was not possible to terminate the friendly greetings and flow of cocktails until eight o'clock, when dinner was served in the Bal-Tabarin.

The nominating committee — Philip W. Moore '01, chairman, William Steinwedell '25, and John Drum '26 — submitted their slate for the vote which unanimously elected the officers: Louis H. B. Bouscaren '04, President; Harold B. Harvey '06, Vice-President; Nelson C. Works '17, Secretary; Trevor K. Cramer '30, Treasurer; Edward P. Brooks '17 and Albert J. Browning '22, Directors for three years; Jabez H. Pratt '12, Director for balance of term expiring 1941. Then came a momentous announcement: at 4:26 that morning a baby girl was born to Mr. and Mrs. Nelson C. Works. So to Miss Elizabeth was given a regular M.I.T. cheer — and that's giving a gal an auspicious start in life.

The four walls of the Bal-Tabarin were appropriately illuminated with shadow-graphs of Technology. *Voo Doo* displays decorated the bar. An "extra" newspaper edition was circulated, announcing the event in alarming headlines. A magician revealed our lack of scientific knowledge, and a small band of traveling musicians were still playing when I left at midnight.

Dr. Jewett rose to give us his greetings, but because of the lateness of the hour he graciously gave place for President Compton's talk to us. Dr. Compton revealed another phase of the Institute's vast range of activities: developments in the treatments of cancer and radium poisoning. He also briefly reviewed the new construction which has taken place at the Institute, showing stereoptican slides of an Institute which is forever keeping abreast of the times.

Over 200 Alumni were seated by Classes at tables decorated by Lonsdale Green '87. Appreciation must be given to the Hotel Sherman and its managing director, Ernest Byfield, for their generous hospitality. Incidentally, Mr. Byfield's son, Hugh, is now a freshman at M.I.T.

Since only honor and no remuneration goes to the workers who make these dinners possible, let honor be given to Sherry O'Brien '17, chairman of the dinner committee, and to his co-workers: Andrew N. Rebori '07, Albert J. Brown-

ing, Herbert P. Beers, Jr., '34, and Leo C. McEvoy, Jr., '38. In token of his achievement in putting new life into the Club, a set of briar pipes was presented to our retiring President, Penn Brooks. After eight years of service, the present Secretary lays down his pen with a tear and a smile, confident in the new Secretary who will carry on with the Club. — EDMUND G. FARRAND '21, *Retiring Secretary*, 1200 Old Colony Building, Chicago, Ill.

M.I.T. Club of Dayton

The Dayton group got off to a late but lively start, initiating its 1939-1940 season with a luncheon meeting at the Engineers Club on February 10. We adopted a new name and a new set of officers. Our speaker was Levitt Luzern Custer '13, who held forth on the subject of "Lightweight Automotive Equipment." Custer stood for the idea (a commendable one) that any gadget which weighs more than what it carries isn't worth its salt. To show us just what could be done when a fellow really tackles the problem of reducing the weight-freight ratio, Luzern referred to the many products of the Custer Specialty Company. Scooters are the coming thing: lots of passengers a pound, and lots of miles a gal (and lots of gals a picture in Custer Specialty Company ads). The only trouble is that you can't talk some people into riding them — seem to have a notion scooter-riding isn't dignified.

During the current season, instead of gunning for celebrities, we are recognizing that our own membership contains many men of ability. If our first meeting under this policy may be taken as a sample, we look forward to an interesting season. — New officers are Benjamin S. Kelsey '28, President; L. Luzern Custer '13, Vice-President; and Harry Schecter '39, Secretary. — HARRY SCHECTER '39, *Secretary*, Wright Field, Dayton, Ohio.

Technology Club of South Florida

For its third anniversary dinner and meeting, held on February 27 in the Professional Building in Miami, the Club had as guest speaker Mormon M. Parrish, Florida state director of the Federal Housing Authority. His résumé of the F.H.A. included a discussion of the purpose of the authority, its field of activity, and how it works. Because of the speaker's prominence, many non-Technology engineers, architects, contractors, and others identified with the building industry were among the forty-one present.

Charles S. Symonds '35 was chairman of the meeting. On his committee were George E. Batcheller '10 and Richard L. O'Donovan '27. Technology men who attended included James L. Kimball '85, Mr. Batcheller, Fred E. Zurwelle '20,

Edward I. Mandell '21, J. Coleman Jones '23, Clarence P. Thayer '23, Thomas P. Coogan '24, Stanley P. Fosgate '24, Harry R. Gamble '26, Mr. O'Donovan, Alexis B. Kononoff '29, B. Howard Brown '30, John W. Hoover '32, G. Murlin Drury '35, and Russell H. Brown '38. — CLARENCE P. THAYER '23, *Secretary*, 1760 Northwest 41st Street, Miami, Fla. JOHN F. AUSTIN '38, *Reporting Committee*, Switzer Marine Electric Company, 19 Southwest 6th Street, Miami, Fla.

Technology Club of Milwaukee

We held an informal dinner meeting on February 29 at the Stratford Arms. The program for the evening consisted of a brief dissertation by each man in turn concerning the nature of his work and activities, which we believed would be of great interest to all, as well as an aid to becoming better acquainted. Of interest was the diversity of the work of what might be termed a typical group of graduates of a technological school. A classification of the nature of the occupations yielded the following result: Five engaged in consulting engineering, research, and so on; four, manufacturing and production; two, engineering sales; two, teaching; one, the insurance business; one patent attorney; and one surgeon.

Great interest seemed to be aroused by this discussion, and it continued long past the usual closing time. Attending were John F. H. Douglas '05, Lemuel D. Smith '06, Leon J. D. Healy '09, Kenneth B. Howell '12, Laurence M. Dalton '19, Harold E. Koch '22, Julius W. Werra '22, Randall W. Lutd '23, Edgar B. Godley '26, Leo Teplow '26, Ralph E. Boeck '28, Erling S. Mathiesen '29, Bruno H. Werra '32, John B. Ballard '35, Robert M. Osborn '36, and Arthur L. Sarvis '36.

Our April 5 meeting at the Schroeder Hotel included the ladies. It was the first time in recent years that we had tried this type of meeting, and we made special efforts to secure a large attendance. All Alumni in this district, both in and out of Milwaukee, whose addresses the Secretary had, received notices of this party. — ROBERT M. OSBORN '36, *Secretary*, 2840 West Highland Boulevard, Milwaukee, Wis.

M.I.T. Club of Northern New Jersey

As Miles Pennybacker '23, Vice-President in Charge of Programs, so well put it, this Club went in for coeducation, cuisine, conviviality, and culture on the evening of March 15. The date was the fifth anniversary of the famous charter banquet, but only a few of the 105 present remembered that date. Everyone was too busy, for there seemed to be two things

to do every minute of the evening. Lem Tremaine '23 arranged a dinner for all of us at Firenze's in New York City, with dancing between courses. This was the first time we have had a party for the ladies, and they added greatly to the enjoyment of the evening. Through the efforts of Mrs. Bea Lassiter (wife of Dick, '24) and Mrs. Laura Coleman (wife of Bill, '24), every lady was presented with a corsage.

After dinner and too few dances, Bob Shaw '23, director of the New York Museum of Science and Industry, provided a series of top-notch demonstrations at the museum for our benefit. How large and important this museum has grown since Bob first started it on 42d Street! Here for the first time in our lives we heard the words "Massachusetts Institute of Technology" spoken by someone other than a human being. It was the Voder talking. Everyone laughed when the Voder first tried to say it, for all we heard was "Hades." The next try was perfect, however, and we were all satisfied that the Voder could say anything after that. A strange incident happened at the drawing of the ten free airplane-piloting lessons. Henry LaCroix '28 won a ticket, and it was his chance to draw. As luck would have it, he drew his wife's ticket, and now they are going to take their first free flight lesson together.

Great plans have been made for the banquet to be held on May 2 at the Newark Athletic Club. The big billings are: "The Mystery of W2XMN, or Major Edwin H. Armstrong's Bombshell for the Radio Industry," with Major Armstrong, himself, explaining and demonstrating the mystery. "Engineering and the End of Man" is a title which has been bothering us ever since Professor Magoun '18 gave it to us as the name for the talk he is to give at our banquet. Just what does Maggie mean by the word "end"? Does he mean the goal or the finish of man? However it is, we shall be glad to hear him, for the committee has been searching since June, for a man who could revive the art of after-dinner speaking. They believe they have found him in F. Alexander Magoun of the Institute.

Arthur W. Lunn '09 is to be toastmaster. Art has been one of the mainstays of the Club, and it is has been through his efforts that we have enjoyed such cordial relations with the Newark Athletic Club. Election of officers will take place at the banquet. For reservations, phone Earl C. McMahon '26, 40 Francisco Avenue, West Caldwell, N.J., Caldwell 6-3085-W. — CLAYTON D. GROVER '22, *Secretary*, Whitehead Metal Products Company, Inc., 303 West Tenth Street, New York, N.Y. — FREEMAN B. HUDSON, Jr., '34, *Assistant Secretary*, Colgate-Palmolive-Peet Company, 105 Hudson Street, Jersey City, N.J. — NEWTON S. FOSTER '28, *Assistant Secretary*, 73 Daniel Avenue, Rutherford, N.J.

Technology Club of New York

By far the most important event of our year was the dinner at the Waldorf-Astoria on March 5. By now it seems

repetitive to explain that this was the occasion of the tenth anniversary of Dr. Compton's acceptance of the presidency of the Institute. The Review stole our thunder, and you will already have found on page 241 of the April issue substantially the account we would have presented here.

Many other social functions filled the calendar of the Club during the late winter season. There were many class dinners and meetings and several course symposiums. Informal bridge tournaments, luncheons, and get-togethers have been increasing steadily since the Club moved to the completely furnished clubhouse on 39th Street. Membership is at a new high, and the employment department is again very active in placing Technology men. This sharp revival in interest has exceeded everyone's expectations and is attributed to the return of better times and to the increased facilities which the Club now offers. — JAMES P. EDER '34, *Secretary*, 24 East 39th Street, New York, N.Y. CONSTANTINE S. DADAKIS '34, *Publicity Committee*, 644 Riverside Drive, New York, N.Y.

Niagara Falls Technology Club

The Club held its first meeting of the current year on March 6 — a dinner at the Niagara Club. Thirty-four members attended. — Michael G. Kelakos '35, William H. Roberts, Jr., '31, T. Francis Twomey '33, and Lauren B. Hitchcock '20 were elected president, vice-president, secretary-treasurer, and sergeant-at-arms, respectively. — After an excellent dinner, we were shown two high-speed Edgerton [27] reels, a reel of colored movies of students sailing dinghies on the Charles River, and a single colored reel of freshman camp. All of these were very interesting and were well received by the group. — We hope to have several meetings during the coming year. — T. FRANCIS TWOMEY '33, *Secretary*, 321 First Street, Niagara Falls, N.Y.

Technology Club of Rhode Island

Rhode Island Alumni held a dinner at the University Club in Providence on the evening of January 25. It was ladies' night, and about fifty, including wives and other guests, were on hand. After dinner the entire crowd adjourned to the Rhode Island Auditorium to see the performance of the Ice Follies of 1940, about which all seemed most enthusiastic.

The next dinner was held on Friday evening, March 29, at the Annawan Club in Rehoboth, Mass. This club is famous for its steak dinners, and those who had been there before needed no urging to go again. Little formal entertainment was provided, as the men enjoy the opportunity at such dinners for a sociable game of contract or poker afterward.

It is planned to hold the annual meeting of the Club in May, probably as usual at the Rhode Island Country Club. — DONALD G. ROBBINS '07, *Secretary*, 47 Charles Street, Providence, R.I.

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Technology Club of the Connecticut Valley

The Club had another successful dinner meeting on March 13 with an attendance of sixty-five. Election of officers was held, with the following results: President, Leonard J. Brooks '23; Vice-President, Otto C. Kohler '31; Secretary, John G. Wheale '38; Recording Secretary, Elmer F. DeTiere, Jr., '39; Treasurer, Max Winer '34; Publicity Chairman, Martin M. Kuban, Jr., '37. An executive committee was also elected: Frank J. Lange '09, chairman, Ernest H. Knight '28, Donald A. Robb '33, Theodore F. Lange '01, Ernest Stanley Johnson '32, Lloyd M. Littlefield '26, Basil G. Constantine '26, Donald R. Taber '25, Daniel J. O'Connell, Jr., '29, Robert M. Jordan '34, Alfred Ziegler '31, and Alden F. Butler '26.

We had the pleasure of a talk by Douglas Wesson, who made a trip this summer through Alaska with Father Hubbard, the glacier priest. Illustrating his talk with colored pictures, Colonel Wesson traced his trip from Seattle to Unalaska, the Pribilof Islands, and the landing at King Island. Because of their isolated life on the island, the Eskimo tribes here are of all tribes the least spoiled. Of particular interest was the spectacular Eskimo walrus hunt on the ice floes. In closing, Colonel Wesson showed photographs and told of the preparation of the Eskimos' annual migration to Nome, 90 miles across the Bering Sea, in their open umiaks.

The final meeting of the spring season is scheduled for Wednesday, May 8, at the Highland Hotel, Springfield, Mass., with Horace S. Ford, Treasurer of the Institute, as our guest speaker. The title of his talk, as announced, is "Technology Facing the Fecund Forties." — JOHN G. WHEALE '38, *Secretary*, Hartford Ordnance District, United States Army, 3640 Main Street, Springfield, Mass.

CLASS NOTES

1876

The death of William F. Codd occurred on March 14 in Nantucket, Mass. Codd, who was in his eighty-sixth year, made his year-round home in Nantucket, where he was formerly associated with the Wannacomet Water Company. — CHARLES T. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass.

1877

Our printing of the diary of Francis H. Bacon was interrupted by the sad news of his death, on February 5, at his home in Canakkale, Turkey, in the former British consulate, where his wife was born. Bacon was born in Chicago, Ill., July 3, 1856, the son of Henry and Elizabeth Kelton Bacon. His father was born August 17, 1821, in Natick, Mass., and his mother, September 26, 1831, in Lexington, Mass. They were married in Natick on September 25, 1855. The father died in Wilmington, N.C., April 12,

1877 *Continued*

1891, and the mother, in Winchester, Mass., May 21, 1912. There were seven children in the family: Francis Henry, Katherine (Mrs. W. B. McKoy), Jane Hayward, George Fisher, Henry, Lucy Elizabeth, and Carl Kelton.

As his father was a United States engineer, Francis went to school in various places: Chicago, Ill.; Ontonagon, Mich.; Watseka, Ill.; Terre Haute, Ind.; and Saco and Biddeford, Maine. At Southport, N.C., he did not go to school but worked with his father. He studied at the M.I.T. for two years as a special student in architecture, leaving in 1876. A complete account of his lifework, written by himself, appeared in the December, 1937, number of *The Review* and in the February, 1938, issue. Bacon married Alice Calvert, daughter of the British consul, on June 27, 1885. A son, Frederic Calvert, was born in Cambridge, Mass., on July 26, 1886.

The last personal contact I had with Francis was a postal card, written on November 14, which took over a month coming. In it he expressed the hope that Kittredge would get better of his heart attack, advising a diet of vegetables, fruits, and salads. He also requested some tomato seeds from Burpee's. These I sent, along with two views of the excavations for the foundation of the New England Mutual Life Insurance Building where the Technology buildings were formerly located. Francis did not live to receive them, and the following answer came from H. Lee on February 11: "Your letter of January 2 to Mr. Bacon arrived yesterday, and Mrs. Bacon has asked me to reply to you on her behalf. Francis H. Bacon . . . died at his home here on February 5 and was buried in the British Cemetery at Chanak. Mrs. Bacon has been so pleased to get your letter. The Reviews for December, 1939, and January, 1940, are both here and will be much valued by her, as are the tomato seeds. It is very interesting for myself, as a member of the Bacon household here, to reread the diary of our old friend's doings in Athens, which I had read previously in manuscript form. Every paragraph recalls the gusto with which he narrated the details of his trip when he got back to Chanak. Till his last illness he retained that faculty of enjoyment of life. But that Athens trip was a peak period, for there he relived early days among his three chief interests: archaeology, Classical architecture, and friends. Our little community here was too circumscribed to give the full savor of life which he had the capacity of assimilating, but he nevertheless continued to derive keen pleasure from his large correspondence with friends of other days, and had an almost photographic memory for past events. You will, I trust, excuse a stranger's replying to your letter, but no doubt you will appreciate that Mrs. Bacon is in no state to write at present."

Few of us realize our classmate's ability and the work he accomplished. Among other things he designed the marble shrine in Washington, containing the Declaration of Independence and the

Constitution of the United States, and the present seating in the national House of Representatives. Besides his widow, he is survived by his son, one brother, and two sisters. (His brother Henry was architect of the Lincoln Memorial at Washington.)

In the 1877 classbook covering 1877 to 1910, Bacon said that his favorite amusements were country life, yachting, and music. Once Bacon sent me a copy of a prayer directed to Jupiter by Cleanthes, a Stoic philosopher born at Assos about 300 B.C. We quote a part of this which seems to express Bacon's feelings: ". . . O God from whom all gifts descend, who sittest in thick darkness, thunder-ruling Lord, dispel this ignorance from the mind of man; deign to enlighten his soul; draw it to that eternal reason which serves as thy guide and support in the government of the world; so that, honored with a portion of this light, we may in our turn be able to honor thee by celebrating thy great works unceasingly in a hymn. . . ." — BELVIN T. WILLSTON, *Secretary*, 3 Monmouth Street, Somerville, Mass.

1883

Good old Ed Stevens turned up in Winter Park, Fla., at the Secretary's new habitation and abided with us for a space. He hopes to go to South America (west coast) in June or July to look after the various hospitals for which he is architect. Meanwhile we suggest that members of '83 drop in to see him at his office, 45 Newbury Street, Boston, whenever near by. He will be delighted to see you. He represented the Class at the Alumni meeting on March 25 at Walker.

The Secretary is writing a series of six essays (weekly) for the *Herald*, published here, on (I) "Governments and Money," (II) "Government and the Treasury Gold," (III) "Government and the Budget," (IV) "Government and the Public Debt," (V) "Government and Bank Deposits," and (VI) "Government and the Business Cycle." These will be reprinted as a book for general circulation. — HARVEY S. CHASE, *Secretary*, 431 Chase Avenue, Winter Park, Fla.

1888

William J. Besler, son of our classmate William G. Besler, chairman of the board of the Central Railroad Company of New Jersey, was among those living inventors who received the special award of the National Association of Manufacturers during the recent commemoration of the 150th anniversary of the American patent system. These inventors were chosen by a committee headed by Karl T. Compton, President of M.I.T., and were hailed as Modern Pioneers. Mr. Besler was chosen in recognition of his inventions for the automatic control of high-pressure steam boilers and also for inventions in the field of vacuum brakes for automobiles and heavy-duty service on busses, trucks, and trailers.

The unveiling of the portrait of Stone and Webster shown on page 246 of the April Review was celebrated with a tea

in the office of President Compton. This portrait completes a series of pictures of distinguished engineers and scientists — a series given to the Institute by the late Mr. and Mrs. Henry A. Wise Wood.

After forty-seven years of happy married life, Mrs. Frederic J. Wood passed away at her home, 2 Colliston Road, Brookline, Mass., on February 28. Funeral services were held at the Second Unitarian Church, Coolidge Corner, where the large floral display indicated the number of her friends. Harry Horn and the Secretary were present as representatives of the Class. Burial was at Sleepy Hollow Cemetery, Concord, Mass. In addition to her husband, one daughter survives.

On the same day, February 28, Eleanor G. Ellis, wife of Fred E. Ellis, superintendent of public works of the city of Melrose, Mass., died in her sleep at her home, 186 Upham Street, Melrose, where services were held on March 1. Mrs. Ellis was a lifelong resident of Melrose and active in the affairs of the Universalist Church and the Melrose Women's Club. Besides her husband, she is survived by two daughters, Mrs. Ernest Hunter of Melvin Village, N.H., and Mrs. Donald Height of Wellesley.

Mary Hutcheson, who entered with our Class in 1884 from Columbus, Ohio, as a student in chemistry and biology and who remained for three years, was one of the early women students at Tech. In 1890 she married the late George H. Page. They had two sons and two daughters and several grandchildren. Mrs. Page died at the age of eighty at her home in Wellesley, Mass., on February 9, the fiftieth anniversary of her wedding day. From the early Nineties she was interested in women's suffrage. She was president of the Brookline Equal Suffrage Association and later of the Boston Equal Suffrage Association. In 1910 she was elected president of the National Women's Suffrage Association. She wrote many books on the subject.

Ted Foque wrote from Orlando, Fla.: "Have been around Florida for five weeks, but it is 'no good' this year. Have not even unpacked any summer clothes. Will try the East Coast next week and try to get thawed out." — The Secretary received another nine-thousand word "ditto" letter from Fred Nichols from his winter home at 1406 11th Street, St. Cloud, Fla. I am reading it in installments, as it is too long for one sitting. Fred doesn't feel the cold, for he is so busy hitting the typewriter when he isn't playing golf or collecting specimens. — Edward M. Smith, II, emeritus construction engineer, Boston and Maine Railroad, North Hampton, N.H., recently sent the Secretary his complete family tree, showing three children and two grandchildren, for which document we thank him. Deacon Smith started with the Boston and Maine the summer after he was graduated and has not lost any time to date, except a few months with the Baldwin Locomotive Works in Philadelphia in 1890. Some record! — Ben Buttolph completed his first emeritus

1888 *Continued*

year on April 1. Fifty-two years with the same company is a long time. His present home address is "The Minden," 123 Waterman Street, Providence, R.I.

Mrs. Thomas Hyde Choate, granddaughter of Edwin S. Webster, President of the Massachusetts Horticultural Society, helped choose cinerarias, hyacinths, tulips, and daffodils for the Webster exhibit at the sixty-ninth New England Spring Flower Show held in Mechanics Building, March 11 to 16, according to the rotogravure section of the *Boston Herald*. Ned went to Florida after winning all the gold medals, blue ribbons, and so on, as usual. — Mr. and Mrs. William G. Besler were the only '88 people present out of over five hundred at the all-Technology dinner held on March 5 at the Waldorf-Astoria in New York City. The Beslers were honored with seats at a table directly in front of the toastmaster and Dr. Compton, for whom the dinner was held. They were very enthusiastic about the quality of the audience, as well as of the speechmaking.

As we have referred in recent notes to Tech-Harvard athletic competition during our time at Tech, over fifty years ago, we thought we would like to see the present fencing team perform. So we went to the meet on March 6. We asked the man next to us who would win. He answered: "Harvard, of course; my son is on the team." Well, the bouts commenced, and Tech won the first four out of five foils bouts, and, when halfway through, the score was 12 to 6 in favor of Tech. At the end of three hours of fencing, Tech had won 14 out of a possible 27 bouts. It looks as though the onetime underdogs were waking up.

When these notes are being read on May 1, the Secretary will be back at his summer home in Casco Bay, Maine, where he will stay till after he votes for President. — BERTRAND R. T. COLLINS, *Secretary*, Chebeague Island, Maine.

1890

That our fiftieth reunion at Marblehead, June 1 and 2, is in many minds is evidenced by the fact that every little while another classmate sends word he plans to be there. If you have not done so, let us hear from you at once. Transportation from Boston will be provided for those desiring it. Everything will be absolutely informal. It is suggested that Saturday lunch be the time for guessing who's who; dinner, for telling what's what.

The Alumni Office has just sent word of the death of Schuyler Schieffelin in 1935. We have very little information about him in our records other than the fact that in 1896 he was a wholesale druggist and during the World War he served in aviation in France.

The address of John G. Crane has been changed to Apartment 504, 1909 19th Street, N.W., Washington, D.C. — Sidney E. Horton has moved from Hartford, Conn., to Walpole, Mass., and receives mail care of Bardons and Oliver, Inc., 603 East Street. — Francis W. Crosby is now addressed at his home, 2396 Edger-

ton Road, University Heights, Cleveland, Ohio. — Harry Goodwin is to retire in June and will then be on his own, with the title of honorary dean of the Graduate School. Dr. Goodwin will have completed fifty years on the M.I.T. staff. He has seen the Graduate School, over which he has supervision, grow until there are now over six hundred and fifty students working for their doctors' or masters' degrees. His description of the Graduate School which appeared in the February and March numbers of *The Review* gives us but a slight idea of the great work with which he has been associated. — GEORGE A. PACKARD, *Secretary*, 50 Congress Street, Boston, Mass. HARRY M. GOODWIN, *Assistant Secretary*, Room 4-136, M.I.T., Cambridge, Mass.

1892

The death of Edmund Shaw in Los Angeles on December 11 was recorded in the March *Review*. Since then your Secretaries have obtained the following information from Nathan C. Rockwood, who was Shaw's editorial associate on *Rock Products*. For the past several years Shaw had retired to a modest home in southern California, but his pen was never idle, and within the last year he was enthusiastically engaged in rewriting a series of articles on his favorite subject — the classification of commercial sand. This series is now running in current issues of *Rock Products*.

Ed Shaw, of old New England stock, was born in Rockland, Mass., June 11, 1870. He studied engineering at M.I.T. but left school in his junior year to accept a position at the Homestake gold mine in the Dakotas, where he got his first practical experience in a variety of mining problems. While working there he was married. Later he went to El Paso, Texas, which for many years was his family's home. Much of Ed Shaw's life during these years was spent in Mexico and Central America on various mining projects, and he came to speak Spanish fluently and to be much at home among the natives, of whom he was very fond. Being ever philosophically minded he was at home and happy under any and all conditions, so long as there was human companionship to share.

About 1921 he went to Chicago and announced his intention of establishing himself as a consulting engineer to serve the rock-products industry. He early saw the problems to be met in sand classification and recovery, and predicted that the time would come when producers would be called upon to make, what he termed, prescription sand. That time was much longer coming than was anticipated, but he lived to see his prediction come true. Shaw had already shown his ability to write clearly and helpfully about sand and gravel production problems, so after about a year as a consulting engineer, he gave up his practice and joined *Rock Products* as coeditor. There, at last, he was in his element. He left *Rock Products*' active service about ten years ago, after a partial stroke, to take life easier in a sunnier clime. Ed Shaw had the unique

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distinction of being the only honorary member ever elected to the National Sand and Gravel Association. — JOHN W. HALL, *Secretary*, 8 Hillside Street, Roxbury, Mass. W. SPENCER HUTCHINSON, *Assistant Secretary*, 75 Federal Street, Boston, Mass.

1895

This is the last reminder to those who may still be hesitating about attending our class reunion at Swampscott, Mass., on June 1 and 2. The records to date indicate that we will have a great gathering — our forty-fifth — and it is hoped all will take advantage of this class festival.

The attendance at the great New York dinner, given to Dr. and Mrs. Compton, was augmented by five enthusiastic representatives of the Class. Johnny Moore and Mrs. Moore, Fred Cutter and Mrs. Cutter, and Jack Gardiner qualified with the group who were arranged at the table marked "66 to 99." Johnny organized the old folks with the ringing cheer, "Are we happy? We are fine! Sixty-six to ninety-nine." This clearly indicated to the Class of 1900 and the younger folks that a few old-time "iron men" are still in evidence.

Richard H. Rich has moved from Saybrook Point, Conn., to Clinton, Conn., at 20 High Street. — William P. Sargent can now be located at 17 West 10th Street, New York City. He formerly resided in Barrington, R.I. — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass. JOHN H. GARDINER, *Assistant Secretary*, Graybar Electric Company, 420 Lexington Avenue, New York, N.Y.

1896

The mystery regarding the receipt of material from E. C. Jacobs, which was mailed in New Orleans, has now been explained by the arrival of two post cards from him: one mailed in Guatemala on February 26, and one mailed in Mexico City on March 13. Apparently President Bailey of the University of Vermont, where Jacobs has taught geology for many years, felt that Jacobs was entitled to a vacation and gave him a sabbatical leave. He and Mrs. Jacobs started south, and after a considerable period of shivering while traveling from Florida to Texas, they finally found some summer weather and bright skies 5,000 feet above the sea level and 15 degrees north of the equator, in Guatemala, which they describe as a wonderful country for tourists. When he wrote his second card, they were spending some time around Mexico City, visiting mining towns and other places of interest, but were planning to leave shortly by airplane for Brownsville, Texas, and thence would journey through the West and be back in Vermont about the first of June.

As these notes were being written, on March 21, Rockwell was getting away for his annual trip to visit his brother at the old home in Harriman, Tenn. Thence he planned to attend the national collegiate wrestling championship meet at Champaign, Ill., getting back home about April 4. — A letter from Arthur Baldwin in January said that he might

1896 *Continued*

plan a trip to America before long and, if so, he would certainly visit Boston. When and if he arrives, the Boston members of the Class will have to have a get-together. — A note from Lloyd Wayne in Indianapolis enclosed a newspaper clipping stating that Joe Stickney had been re-elected president of the Indianapolis Athletic Club — his eighth term.

Lou Morse in York, Pa., received a letter from Wayne in which Wayne was more communicative than he had been to the Secretary. Although retired, he apparently maintains headquarters in the Telephone Building — not devoting definite hours but being available in an advisory capacity to answer many questions that are put to him by his successor. Wayne's long association with the telephone business in Indianapolis has made his mind a vast storehouse of information which is being drawn upon by his associates whenever problems arise. In the balance of his time he is carrying on former activities and habits, continuing to bowl with the old office league.

Lou Marble in Cleveland reported that he had been through a hospital siege but was convalescing and felt that with the coming of spring he would get back to normal. — Admiral and Mrs. Bakenhus went to Philadelphia for the marriage of their daughter Dorinda to Lyle V. Beck, on March 9, and thence journeyed to Washington, where the Admiral was assigned for temporary work on the navy selection board. — An interesting little mimeographed publication has been received from W. H. Thomas who, with Mrs. Thomas, is carrying on the St. Christopher School in Westfield, N.J. This journal, entitled *Education Foundations*, apparently is issued every month. As would be expected by those of us who know Tommy, it is replete with bright ideas and comments on topics of the day.

Zabdiel Boylston Adams died suddenly on March 16. He was with us for two years as a student in Course IX and then went to Harvard Medical School, where he received a degree of M.D. He was a practicing physician with an office in Boston and a home in Brookline for many years. He was born on January 25, 1875, in Framingham, Mass., the son of Dr. Z. B. and Frances K. Adams. He married Helen Foster in 1907. A son, Z. B., Jr., died in 1939. A daughter, Nancy, is now Mrs. B. P. Bole, Jr., of Cleveland, Ohio, and a son, Samuel, was graduated from Harvard in 1937. Adams had been instructor in anatomy, pathology, and orthopedic surgery at the Harvard Medical School; intern at the Boston City Hospital; surgeon at the Boston Children's Hospital, the Massachusetts General Hospital, and the New England Deaconess Hospital. He was interested in military affairs. He became a captain in the Medical Corps on June 30, 1917, and a major on October 1, 1919. He was with the American Expeditionary Force from July 14, 1917, to January 1, 1919. He was at Base Hospital No. 6 and Casualty Clearing Service No. 48 of the British Expeditionary Force. He served with the twenty-sixth division and the forty-first

division of the American Expeditionary Force and was at Base Hospital No. 114 of the American Expeditionary Force.

Here is a reminder that the Class is scheduled to observe its forty-fifth anniversary next year. Arrangements were made with Charlie Brown at East Bay Lodge in Osterville, Mass., in 1936, for this event, and it is none too early for you to make a memorandum to reserve the dates from Thursday, June 5, through Sunday, June 8, 1941, for the '96 class reunion. — CHARLES E. LOCKE, *Secretary*, Room 8-219, M.I.T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1898

A few new addresses have been received from the Alumni Office: Frank E. Coombs is now living at 2375 Scarff Street, Los Angeles, Calif.; Albert W. Tucker's new address is St. Mary's Campus, Raleigh, N.C.; Charles LeMoyné may be reached at Crescent Rime Drive, Route 6, Boise, Idaho; Elliott R. Barker's current address is 26 Lombard Road, Arlington, Mass. — Howell Fisher of Gibson Island, Md., died on February 10.

One of the Mechanical Engineering students, Harvey Kram '42, who employed his holiday period visiting industrial plants, came back with a very enthusiastic story of his visit with George Anthony, Vice-President of the Wolverine Tube Company, Detroit. George had shown him around with great friendliness.

The Secretary has received from a clipping bureau a very interesting biography of Roger Babson, which appeared in the Mart, Texas, *Herald*. The contents would be familiar to all, but we mention it just to show how the fame of our classmate extends to all corners of our country. — ARTHUR A. BLANCHARD, *Secretary*, Room 4-160, M.I.T., Cambridge, Mass.

1899

Through the good offices of Frederick C. Waddell, I have learned that Arthur B. Foote of Grass Valley, Calif., has been made a life member of the American Society of Civil Engineers. He became an associate member in 1905, a full member in 1913, and is now the only one of '99 thus far to have achieved life membership, as far as Waddell knows. Foote himself did not mention this bit of news in his letter to me, but he did write most interestingly of the anomalies attendant on the boosting of wages above their market value by arbitrary methods: Organized labor in the building trades, coal mining, railways, merchant marine, and other industries is demanding in exchange for its services more than the balance of the people are able to produce. The government therefore is forced to borrow huge sums of money to make up this shortage of buying power, and there are the nine to eleven millions unemployed — page Dorothy Thompson! Wages are being determined by law instead of the value of production, to the detriment of many other industries

and businesses besides the railroads, much in the public press. The transportation industry paid out more than it took in for seven out of nine years — 1929 to 1937, inclusive. The railroads are forced to pay millions of dollars for services that are not rendered. It doesn't take advanced arithmetic or higher mathematics to forecast the end of such a policy.

From Grass Valley to New York City is a long distance as the crow flies, but Edwin A. Packard, writing from the latter, tells me that he attended the Tech alumni dinner in New York City on March 5, when Dr. Compton celebrated the tenth anniversary of his acceptance of the presidency at M.I.T. Packard reported a lonesome twosome representing '99 — his own good self and Stark Newell of Bath, Maine. Only twenty-four or twenty-five persons were present as representatives of the Classes from 1868 to 1899, inclusive. Thirty-one Classes were represented by twenty-five people, and of these twenty-five there were seven wives of graduates. Eighteen men, then, represented thirty-one Classes, and two were graduates of the Class of '99. The percentage looks high. Each one figure it out for himself.

James B. Ellery, writing from Annisquam, Mass., has signified his intention of attending the '99 reunion, June 1 and 2, at the Essex County Club, Manchester, Mass. Ellery is busy, like all the rest of us, trying to make his possessions pay more than a meager return on investment. He still plays with his hobby, "single tax or Georgism," as he calls it, and hopes a good crowd will turn out again this year on June 1.

Norman Seavey, writing from Hollywood, Fla., regales me with the tale of a western trek which included the Grand Canyon; the Petrified Forest; old Santa Fe, where spirits of Spanish dons still linger; the Yosemite Valley of far-famed beauty; San Francisco and the Fair; Portland, Ore.; Seattle, Wash.; Yellowstone Park, where Old Faithful does his stunt; Salt Lake City, Denver, Chicago; and New York and its Fair. In Salt Lake he looked up Bayard Mendenhall '01, whom he had not seen for thirty years. Time looked backward in its flight, and they took up discussions where they had left them thirty years ago. Seavey has taken up his old hobby — photography. His western trip gave him ample opportunity to work with the magic that is color.

Frederick Watkins, from Chicago, writes that he betook himself to Florida a few months ago to perpetuate the southern scene in color on his films. At least that was his intention, but all he found were winter scenes — for the winter was a mean one, and chill, with icy roads through Hattiesburg, Miss., 12 inches of snow, and a zero temperature almost to the Gulf of Mexico. Old Man Winter stayed right by until Watkins got into Florida, and even there were traces of the freeze that earlier beset the region. At Rainbow Springs, however, Watkins got underwater shots of marine growth and

1899 *Continued*

of fish rimmed with the prismatic colors that give the springs their name. He visited the colorful cities of St. Petersburg and Clearwater, Sarasota and Fort Myers, then across the state to Palm Beach and thence to Pompano Beach, just north of Fort Lauderdale. He spent the full month of February at Pompano Beach, with side trips to points south, including Miami, where he watched the Pan American clipper ships land — one every 15 minutes — and then pull into the hangars for overhauling. Watkins wishes he could start all over and take up the aviation end of engineering. — W. MALCOLM CORSE, *Secretary*, 1901 Wyoming Avenue, N.W., Washington, D.C. ARTHUR H. BROWN, *Assistant Secretary*, 53 State Street, Boston, Mass.

1900

A recent notice of faculty changes includes mention of Edward E. Bugbee, Associate Professor of Mining Engineering, who has been granted a leave of absence. He has been appointed to an exchange professorship at Stanford University for the next academic year. — Just received a long letter from Henry D. Jouett in which he stated that he is planning to attend the reunion in June and that he is working hard on Tuck to get him to come, too.

A card from Dick Wastcoat, mailed at St. Petersburg, informed us that he called on the Thurbers, who were spending the winter in Florida. With the thermometer at 40 degrees poor Dick was wailing because there were no bathing girls in sight. Have you made up your mind yet to join the merry throng at East Bay Lodge, Osterville, June 1 and 2, the fortieth reunion? Send in your "yes" right away. — C. BURTON COTTING, *Secretary*, 111 Devonshire Street, Boston, Mass.

1901

George Cross, who for some time has been the executive director of the Worcester Historical Society, Worcester, Mass., recently presided at a Colonial dinner which was held in Worcester. Those present dressed in appropriate costume, Captain Cross making use of the uniform of a Colonial general which happened to be included among the treasures of the Historical Society. The guests had considerable fun with Cross, questioning him as to which branch of the service the costume belonged. We understand that he really desired to attend the dinner as General Burnside of the Civil War. The appropriate uniform did not fit, however, and he also had difficulty in arranging for the proper kind of whiskers to go with General Burnside. In any event, the dinner was a huge success. Your Secretary can testify from several visits that the rooms of the Worcester Historical Society are well worth seeing, and can also promise that all '01 men will receive a cordial welcome from Captain Cross.

Ted Lange of 62 Massachusetts Avenue, Springfield, Mass., who is apparently taking considerable interest in the meetings of the Technology Club of the Con-

necticut Valley, wrote recently about a meeting which was held on March 13 at Springfield. The speaker was Douglas Wesson, who gave a talk and movies regarding the Eskimos and hunting in Alaska with Father Hubbard. Colonel Wesson's brother, Harold, is an '01 man and is now president of Smith and Wesson, and we should judge that the meeting at which his brother spoke was very well attended. If any '01 men are to be in Springfield about the middle of any month, we suggest that they get in touch with Ted Lange and attend one of the meetings of the Technology Club of the Connecticut Valley.

We also have a message from Honolulu, Lyman Bigelow having written Claude Patch to thank him for one of the Tech steins which Claude received as a souvenir at the last Alumni Day dinner and which he sent to Lyman for use in a country where the right kind of liquids are enjoyed from such steins. Claude, who was probably better known to his classmates as Dan, actually started with '01 but finished with '02 because of the fact that he patriotically participated in the Spanish-American War and so lost a whole year. Claude, who now has his office at 862 Park Square Building, Boston, also wrote that he gave a talk on February 26 at Walker Memorial at the Institute and exhibited a number of slides which were made from the snapshots he took on his recent trip to Hawaii.

Matt Cushing, from his ranch in Saratoga, Wyo., wrote that he has seen no Technology men since a trip about three years ago when he and his wife attended a small tea party on the lawn of the American embassy at Buenos Aires. Matt stated that the Tech man's wife was very interesting and that she asked so many questions about Wyoming dude ranches that when he left he found that he could not recall her husband's name. Matt went on to say that "out on the plains, M.I.T. is naturally enough just another institution of learning whose name does not carry football prestige, a qualification worthy of note."

We much regret having to announce the death, on February 27, of Alexander J. Taylor of Wilmington, Del. At the moment, we have practically no information regarding Taylor's recent experiences. We believe that at the time of his death he was still president of the Delaware School Auxiliary Association and of the Delaware School Foundation. Your Secretary will be glad to receive any other biographical material about Alex Taylor.

We wish to remind all '01 men that June 3 is Alumni Day at M.I.T. and that everybody who can should give himself the pleasure of at least being present at the Alumni Day dinner that evening. We could then have a full '01 table or tables and perhaps start planning a bit for our fortieth reunion next year.

As these notes are being written — March 15 — your Secretary is in the midst of moving to Portland, Maine, where he is looking forward with a great deal of pleasure and anticipation to his

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new position. For many years he has wished he might make his home in the good Republican state of Maine. The Secretary's new address follows. — ROGER W. WIGHT, *Secretary*, The Travelers Fire Insurance Company, Chapman Building, Portland, Maine. WILLARD W. DOW, C.P.A., *Assistant Secretary*, 20 Beacon Street, Boston, Mass.

1902

Word has been received from Robbie that our Class was represented at the dinner given to Dr. Compton on March 5 by the New York Tech Club. Besides Robbie, there were present Jack Fruit, Lester Hammond, Montgomery, Cates and Mrs. Cates, Kellogg and Mrs. Kellogg, Place and Mrs. Place. Place reported that both of his daughters are married and that he is on the list of class grandfathers. Cates has occasion also to announce the arrival, on March 7, of Louis Shattuck Wilkin, son of Barbara Cates Wilkin. This makes Cates thrice a granddad.

A class dinner for the Greater Boston '02 men was held at the Walker Memorial on February 28. Thirteen men were present: Adrian Sawyer, A. H. Sawyer, Sherman, Eames, Reynolds, Upham, Patch, Philbrick, Bourneuf, Williams, Ned Baker, Bassett, and Walter Fitch. Disproving the superstition that thirteen is unlucky, it was an extremely happy gathering. Patch showed his lantern slides of scenery in the Hawaiian Island group and told of the activities of the many Tech men out there. Many more of the Class would have come but for conflicting engagements. To these and to all others, we say: Remember to get back to Tech on Alumni Day, June 3, and make the class group a large one, both at the midday luncheon and the evening dinner. — BURTON G. PHILBRICK, *Secretary*, 246 Stuart Street, Boston, Mass.

1904

Mayor Tobin of Boston has made an \$18,000,000 proposal for "streamlining" downtown traffic, under which proposal a project committee has been set up to study and formulate a detailed program of traffic improvements. The personnel of the committee includes Frederic H. Fay '93 of the Massachusetts state planning board and our classmate Otis D. Fellows, representing the metropolitan planning division. Dwight is a member of the Boston Society of Civil Engineers, and at their meeting in April, 1939, he presented a paper on "Highways of the Boston Metropolitan District, Their Origin and Evolution," which was published in the October *Journal* of that society.

During the past winter the National Association of Manufacturers sponsored a series of Modern Pioneer banquets in commemoration of the 150th anniversary of the American patent system. At these banquets scrolls were awarded to men who have made outstanding inventions which have changed the course of American life. The recipients were chosen by a committee of which Dr. Compton was

1904 Continued

chairman. At the banquet held in Los Angeles on February 16, thirteen such awards were made, and among the recipients was Herb Kalmus for his work in the invention and development of the colored moving pictures.

The annual reunion of the Class will be held on June 21, 22, and 23, at Boxwood Manor, Old Lyme, Conn., where we had such a fine time at the thirty-fifth last June. — I have received the news of the death of Alice G. McCarthy, who died at her home, 146 Thorndike Street, Brookline, Mass., on February 5.

This issue probably contains the last set of 1904 class notes before the vacation season. I hope you all have a pleasant and enjoyable summer and that each of you may have some happy experience which you can write me about, so I can tell the rest of the classmates. Remember Alumni Day on Monday, June 3; if you are in the vicinity of Cambridge, do not fail to attend. You will always find some of us there, and we always enjoy ourselves, particularly at the evening banquet at the Statler. — HENRY W. STEVENS, *Secretary*, 12 Garrison Street, Chestnut Hill, Mass. AMASA M. HOLCOMBE, *Assistant Secretary*, 4817 Woodway Lane, N.W., Washington, D.C.

1906

Burton W. Kendall, VIII, was included among inventors honored at the New York meeting of the National Association of Manufacturers, held on February 27 to celebrate the 150th anniversary of the United States patent system. Kendall is distinguished for thirty important patents in long-distance telephony. From 1906 to 1908 he was an assistant in physics at M.I.T. and from 1908 to 1913, a graduate student in physics at Columbia University and also assistant in physics at Barnard College, ending his career in the teaching profession as an instructor in physics at Columbia. In 1913 he joined the Western Electric Company and is now director of circuit research in the Bell Telephone Laboratories. The latest organization chart of the laboratories lists Otto Blackwell, VI, as vice-president.

The following letter was received from Bill Furer: "Whenever I receive anything in the way of an advertisement of either our local or the transpacific telephone service, I think of you. . . . Today, in addition to receiving a picture of a pretty maiden trying to reach one Kimo Kidder in Boston on the phone (don't know why they got so personal, but one can easily tell by the smile on her face that she's trying to reach you), Pan American Airways sent over a suggestion that I avail myself of their clipper service and fly to 'Frisco. I'll pass that on to you and let you try it in the reverse direction. You could leave San Francisco this afternoon and before I got up tomorrow morning you would have landed on the smooth waters of Pearl Harbor. So the old excuse of not having the time holds good no longer. Even I should hop over to the coast about once a month if only they'd move that little decimal point in their

table of fares to the left about two places. . . . Sidney Carr is still an indispensable fixture with the Hawaiian Electric Company, and I'm still practicing architecture. Since June of this year I can boast of the latter occupation with a little more certainty.

"It was at about that time that I at last laid down my old job as secretary of the Engineering Association of Hawaii, which I had held since 1926 but which was becoming all too time consuming. So I wrote my little swan song and suddenly found myself in the spotlight. It seems that when a man has held a job for so long that he is just being taken for granted, it takes a lot of courage to resign. And when he does, he may be looked upon either as a curiosity or — save in his own country, of course — as a prophet. Anyway, my chief secretarial occupation used to be the editing of a little one-page, mimeographed *Weekly Bulletin* which got into many a little far-off place — from London to Tokyo and way stations. And that is how it happened that, after writing my swan song, I found myself the recipient of some very delightful and, at least, comforting fan mail. One of the real gems came from George A. Stetson, editor of *Mechanical Engineering*.

"At a luncheon meeting of the Engineering Association, I listened to a talk by Albert F. Hegenberger, now a major in the Air Corps, United States Army. Heggie is out of '17, M.I.T., and is the 'navigator incomparable' who, with Lieutenant Maitland, 'pilot extraordinary,' made the first successful flight by plane across the Pacific from San Francisco to Hawaii in June, 1927. He is now stationed at Hickam Field, where — just a few miles west of Honolulu — the Army is building up its No. 1 \$14,000,000 aviation field, where a million dollars is spent almost over night, and where an expenditure of more than two million doesn't show more than six inches above the ground.

"*Aloha* to Ned Rowe, to Eleanor Manning O'Connor, and to such other of the good '06 folk who may have leisure enough to allow their memories to wander back a third of a century to the days of the Institute on Boylston Street. Did I ever send you a Honolulu telephone directory? If not, I have frequently intended to do so. The present issue contains 88 Changs, 110 Chings, 36 Chongs, 78 Chuns, and 34 Chungs! You must watch not your 'p's and 'q's but your 'i's and 'a's, for it's so easy to get Mary Ching on the wire when you really wanted Mary Chang! And what a difference just one little letter might make!"

Our Boston papers early in February reported the death of Edward R. Hyde, I, at Manila on February 5. Ed was born in Boston and spent his boyhood in Somerville. He attended the public schools of Somerville and entered Technology with our Class, skipping his last year in high school. After graduation he worked for the Bethlehem Steel Company's shipbuilding division at Fore River in Quincy, Mass., and later was

employed as a resident engineer of the Massachusetts Highway Commission. Hyde had been in the Philippines for nearly twenty-five years and at the time of his death was dean of the college of engineering at the University of the Philippines. He is survived by a widow and daughter.

At the present time Freeman M. Scales is director of research for the Sheffield Farms Company of New York and resides in Mount Vernon. He is married and has two daughters, Elizabeth D. (now Mrs. Philip L. Gamble of Amherst, Mass.) and Ruth D. His work involves the extensive study of bacteriological, chemical, and plant processing investigations.

Report has been received of the death of Frederick H. Wilcox at Smyrna, N.Y., on January 5. Wilcox was a chemist, and the record of his addresses since graduation indicates that most of his life was spent in the Middle West. He was in Chicago from 1917 until last year. — JAMES W. KIDDER, *Secretary*, Room 802, 50 Oliver Street, Boston, Mass. EDWARD B. ROWE, *Assistant Secretary*, 11 Cushing Road, Wellesley Hills, Mass.

1907

On March 13, I received a letter from Mrs. Harry Allen Frame, saying that her husband died on August 1 following a stroke suffered just one year prior to that time. He had made an apparent recovery from that illness, and the family had not been alarmed until a short time before his passing. I wrote a letter to Mrs. Frame expressing the sympathy of the Class. A native of Halifax, Nova Scotia, Harry studied at Dalhousie University in that city and then completed his collegiate work at the Institute, graduating as a mining and metallurgical engineer. He was an apprentice with Penn Steel Company from 1907 to 1909 and engineer with Lake Superior Corporation until 1913; he then became general superintendent of National Products Company, one of the early operators and builders of natural gasoline plants, where he remained for twenty years. With another engineer he designed and built the first absorption gasoline plant in the mid-continent. In 1936 he organized the Frame National Gasoline Company, with field office and plant at Cleveland, Okla., but his home was at 1539 South Yorktown Avenue, Tulsa, Okla., which is the present address of his widow and three daughters — Eleanor, Elaine, and Margaret — aged twenty, nineteen, and nine.

In the February issue of *The Review* we stated that Benjamin F. Mills is in the construction division of the United States High Commissioner's office in Manila, Philippine Islands. During February we were delighted to receive from Mills one of the '07 statistics sheets, confirming this business address. Our classmate entered the Institute in the fall of 1905, having received his A.B. from Williams College in June of that year, and was a graduate in civil engineering with our Class. Following a year's employment with the Penn Steel Company he went to the Philippines and for twelve years was a

1907 *Continued*

civil engineer with the Philippine government. From 1921 to 1939 he did private contracting business in the islands and then went to his present position. He has two sons (aged twenty-six and twenty-four) and three daughters (twenty-one, nineteen, and fourteen) by his first wife, who died on July 4, 1932. He married again in 1936, and his home address is 3 J. Ruiz, San Juan, Rizal, Philippine Islands.

Most of you will probably remember James L. Walsh. Or do you? If I say, Jimmie Walsh, lieutenant in our freshman corps of cadets, who left Tech in 1905 to go to West Point, does that help your memory? I received from the Alumni Office, notice that Jimmie was at the University Club, 1 West 54th Street, New York City, instead of in Detroit, so I wrote him a letter. His prompt reply began thus: "It was a real pleasure to hear from you by your letter of February 2. It quite brought back the old days when we used to give the girls a treat at the Irvington Street armory." On February 21, James L. telephoned me while in Boston for a few hours en route to Montreal — a brief conversation in which he sounded as gay and jolly as of old and in which he promised to write me about his doings.

Rutherford Bingham, graduate in electrical engineering, now lives at Newtown, Bucks County, Pa. From 1907 until February, 1911, he had several connections; then he entered the United States diplomatic service, from which he resigned in 1920. Since that time we know nothing of his activities. — Through the courtesy of Henry Martin, we have learned that Louis A. Freedman, II, has always been identified with the elevator business in some form. He is now located at 33 West 60th Street, New York City, manufacturing electric elevator shoes said to have unusually durable wearing qualities. He also is connected with Bell-Lite Elevator Signals Laboratory, with an office in the Times Building, New York.

The *Montana Oil and Mining Journal* of March 2 reports a brief address given by our classmate Carl J. Trauerman, prominent mining engineer in the Rocky Mountain states, at a meeting of the Northwest division of the United States Chamber of Commerce at Butte, Mont., on February 26. In his talk he outlined a plan to apprise the nation on the importance of metal mines.

To Karl T. Compton, on March 5, I sent the following telegram: "M.I.T. has been richly blessed because of your acceptance of its presidency ten years ago. The Class of 1907 honors and congratulates you and Mrs. Compton on your contributions to happiness and progress in the world. May long continued health and joyous living be yours!" This was addressed to the Waldorf-Astoria in New York, where Alumni tendered an anniversary banquet to Dr. and Mrs. Compton. A gracious message of acknowledgment of this telegram was received from Dr. Compton, extending his greetings to the Class.

Harold Peters Baker, commonly called Horse Power, was associated with our Class for a year or two only, coming to Tech as a graduate student from Princeton. In looking through the 1939 issue of "Poor's Register of Directors" recently I noticed H. P.'s name. He is president and director of the White Haven, Pa., Savings Bank, and a director of the Pennsylvania Wholesale Drug Company of Wilkes-Barre. — In the same book appears the name of A. Shirley Black, who was a lieutenant (along with Jimmie Walsh) in our freshman corps of cadets and who remained at the Institute for only one year. Shirley is a partner of Farquhar and Black, insurance, 18 Central Avenue, Lynn, Mass., a director of the Manufacturers National Bank of Lynn and of the Middlesex Mutual Fire Insurance Company of Concord, Mass., and vice-president and director of the Lynn Mutual Fire Insurance Company. — BRYANT NICHOLS, *Secretary*, 126 Charles Street, Auburndale, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1908

Edgar I. Williams, President of the Architectural League of New York, presided at a recent meeting where pros and cons of Modern architecture as opposed to the traditional school of architecture were discussed.

The following letter was received from Jim McGowan, who is vice-president of Campbell Soup: "Just one minute ago I read, 'Why don't you write us a letter?' For years I have had to read the class notes of 1907 and 1909 to be sure that 1908 was not slipped in between the lines. So I shall be delighted if a lot of our classmates who lead interesting if not dangerous lives will accept your invitation to write. I wish I could contribute, but I have nothing worth while to tell. I have been here — in the 'soup' — since the fall of 1908. Am married and have one son, who is in his second year at Yale. (I think Given has a youngster in the same class.) I travel little (just between our plants — Chicago and New Toronto, Canada) and see few classmates. Manning is the most recent. So that's that." — Many thanks, Jim.

Alumni Day comes on June 3 this year. Last year our Class was well represented at both the luncheon at Technology and the banquet at the Statler in the evening. While we had about a dozen of the fellows present, I hope that this year we can do even better.

We have the following changes of address to report: Eugene L. Brown, Jr., 124 North Dillon Street, Los Angeles, Calif.; LeSuer T. Collins, The Locusts, Marshfield Hills, Mass.; Amos H. Dows, Billerica Street, Chelmsford, Mass.; William R. Heilman, 2938 Magnolia Street, Berkeley, Calif.; Harold H. Howland, 3119 19th Street, N.W., Washington, D.C.; Captain Edwin G. Kintner, United States Navy, Navy Department, Washington, D.C.; Frederick W. Lyle, 1028 South Avenue, Wilkinsburg, Pa.; Joseph

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T. Mohn, 342 Madison Avenue, New York, N.Y.; Harry L. R. Nickerson, Brooklyn Union Gas Company, 176 Remsen Street, Brooklyn, N.Y.; Professor Paul W. Norton, 131 Clarendon Street, Boston, Mass.; Hal M. Radford, 729 Coventry Road, Berkeley, Calif.; George Schobinger, Day and Zimmerman, Inc., Packard Building, Philadelphia, Pa.; Rudolph B. Weiler, 6 Green Tree Building, West Chester, Pa.; Mason T. Whiting, R. M. Bradley, Inc., 8 Newbury Street, Boston, Mass. — Plan to attend Alumni Day, Monday, June 3. Why not follow Jim McGowan's lead and write us what you are doing? — H. LESTON CARTER, *Secretary*, 60 Batterymarch Street, Boston, Mass.

1909

Alumni Day will be on Monday, June 3. Our Class is not planning any special reunion this year, but Alumni Day will give an opportunity for us to see a lot of the fellows at the luncheon at the Institute and at the dinner at the Statler in the evening. It is hoped that many of our Class may find it convenient to attend at least one of the several functions. Send in your reservations early.

Paul Wiswall writes: "The New York Technology Club dinner at the Waldorf on March 5, marking the tenth anniversary of Dr. Compton's acceptance of the presidency of the Institute, brought out about seven hundred diners in spite of the ice storm that crippled electrical service in the suburbs. Our Class, as always, had a good turnout. Ed Hutchinson was there from Detroit. Phil Chase and his wife came from Philadelphia. Tom Desmond, who came from Albany, told us, among other interesting things, that Alice had just sold the manuscript of another children's book about South America. Tom is as active as ever in the New York Senate. At one of the sessions he introduced bills designed to promote traffic safety. He has also been interested in a bill providing that judges under fire for unethical conduct might be removed by the Court of Appeals as an alternate method to the present removal procedure of trial before the senate membership.

"Hearing a rumor that John Mills had been in bed for some weeks with phlebitis, which the dictionary calls an inflammation of the walls of the veins, I drove over to see him. One of John's legs is out of commission, but I should say John was as full of beans as ever. I am sure he will be out soon. When it comes to being cooped up, I can sympathize with him. He showed me a brochure issued by the Bell Laboratories, commemorating the twenty-fifth anniversary of the transcontinental telephone. I discovered that the technical aspect had been written by John and that he did some remarkable work on loading coils in co-operation with other members of the laboratories' staff. These loading coils were indispensable to the final success of the venture, in which such long distances were involved. Chet Pope stopped by my office the other day to tell

1909 *Continued*

me that he was about to sail for South America for a three months' trip. I hope his movie camera goes and that some day after his return we can see some of his pictures."

The National Association of Manufacturers, in observance of the 150th anniversary of the founding of the American patent system, sponsored meetings this winter in several of the larger cities to honor inventors and research workers who have made important contributions to progress through pioneering achievements on the American frontiers of industry. Among the Modern Pioneers honored in the Philadelphia area at a banquet at the Bellevue-Stratford Hotel on February 16 was P. H. Chase, chief engineer of the Philadelphia Electric Company. The award to him was made for his foresight and initiative in developing improvements in cable for transmitting electrical energy at high voltages and in originating an alternating-current network system of distribution — developments which have contributed substantially to improving the reliability of electric service and to reducing costs in the fields of transmission and distribution of electric energy. — Allen Shippee is now with the Central Vermont Public Service Corporation, with headquarters at Rutland. — Merton Belcher, who has been living in Honolulu for some time, is now associated with the Waste Materials Corporation, Ltd.

Your Secretary announces with deep regret the death on February 24 of Arthur E. Norton, who was with our Class during the senior year. A native of Maine, he was graduated from Brown University in 1900 and was awarded an honorary degree of master of arts in 1920 by that institution. He joined the faculty of Harvard Engineering School in 1901, serving for nine years as instructor in mechanical drawing and mathematics. For the next decade he was assistant professor in these subjects and then was advanced to the rank of associate professor. In 1935 he became the holder of the Gordon McKay Professorship of Applied Mechanics. He was a member of several fraternities, the Harvard Faculty Club, and the Hasty Pudding Club. He leaves his widow, Mrs. Mabel Norton, and a son Gardner, an industrial physicist of Boston. — The sympathy of the Class to John Davis on the death of his wife.

John W. Beal, commissioner of the department of public works of Massachusetts, addressed the Worcester County Highway Superintendents Association at a dinner meeting in Worcester in March. — At the annual meeting of the Boston Society of Civil Engineers on March 20, Charles R. Main was re-elected treasurer for a term of one year. — CHARLES R. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass. *Assistant Secretaries*: PAUL M. WISWALL, MAURICE R. SCHARFF, New York; GEORGE E. WALLIS, Chicago.

1910

Three members of the Class were honored at the annual meeting of the Boston Society of Civil Engineers, which was

held at the Boston Chamber of Commerce on March 20. Three of the eight men at the head table were members of our Class. Charlie Greene was the recipient of the Clemens Herschel Prize, awarded for a paper before the sanitary section of the society on the "Mechanical Equipment for Refuse Incinerators." Dean Peabody received the prize of the designers' section of the society for a paper on the "Continuous Frame Analysis of Flat Slabs." Jack Babcock, a former President of the society, made the presentation of the Desmond Fitzgerald Prize. — Bob Dillon spent part of the winter in Guatemala, returning to his desk with the Boston Edison Company on March 21.

Your Secretary has received numerous letters from classmates in regard to the coming thirtieth reunion. Among those who have written, giving their ideas on the program, are Frank Bell, Nathan Ransohoff, Andrew Fabens, Arthur Stein, Larry Hemenway, Alfred Phillips, Jr., George McRae, Chester Wilson, Dick Bicknell, George Mylchreest, Harold Manson, Roy Abbe, Harold Akerly, Dick Goodwin, Arthur Harding, Walter Spalding, Bob Burnett, and Albert Beach. If any classmate has not received a notice of the June reunion program, kindly send your Secretary a letter, and he will make sure you receive full information. — HERBERT S. CLEVERDON, *Secretary*, 46 Cornhill, Boston, Mass.

1911

Once again that seven-eleven combination turned up at the testimonial dinner to Karl Taylor Compton at the Waldorf-Astoria, March 5, for there were seven couples at the '11 table! The classmates present, each accompanied by friend wife, were Bob Haslam, X, Bob Morse, VI, Dick Ranger, VIII, Nat Seeley, II, Don Stevens, II, and Zeke Williams, XI, while the Haslams had Mr. and Mrs. John T. Ward along with them.

Although I was unable to attend, we have a fine ringside account giving the 1911 color, as reported to me by Don Stevens: "The best part of such a dinner, aside from honoring our grand President, is the opportunity to see one another, to size up what we used to look like and to kid one another about what we look like now. The fact that all our ladies were beautiful and sparkling was the crowning touch at our table, while at the head table Mrs. Compton was very charming indeed and won the hearts of all present. Of course there is no question but that Dr. Compton has had our hearts for many years. We all expected to dance in the Empire Room . . . we love to dance, but not in a human stockyard. . . . New York hotels . . . get the customers in, crowd the tables all over the dance floor, turn as many cattle loose as possible in a very small pen, and let the dancers make out as best they can in the resulting struggle. . . ."

Thanks a lot, Don, for the colorful story. I sent the following telegram early in the evening: "Nineteen-Eleven greets

you seriously wishing many years continued success," as a tribute to a fine man who stands out today as Dr. Maclaurin stood out in our undergraduate days.

An obituary in the *Boston Herald* in early March told of the death of John Bigelow Walcott, VI, in Detroit on March 7. With us for but three terms, he never took an active interest in class affairs, and for many years we have had no good address for him. He came from Brookline and the funeral was from the residence of his sister, Mrs. Gayle T. Forbush of Natick, Mass. Surviving him is one son, John William Walcott, a senior at Phillips Exeter Academy.

Two classmates, for whom new addresses recently came from the Alumni Office, responded beautifully to my suggestion that they w.t.D. From Fort Winfield Scott, Calif., Henry C. Davis, Jr., VI, writes: "I have been stationed here a little over two years now as executive officer (second in command) of the harbor defenses of San Francisco, and I hope I may stay here long enough for my younger daughter to finish Stanford; she is a junior now. I have an older daughter who lives here with me and has a job in San Francisco. We are very busy professionally with the increase in strength of the Army and no increase in officers, which makes it a bit pressing, to say the least. However, it leaves very few dull moments, I can assure you. I have no news of the Class. So far as I know, I am the sole member here. I see the Selfridge twins occasionally, one of them 1912 and the other 1913. Most of my service since the World War has been on the West Coast or in Honolulu; so I am pretty well out of touch personally with the East. Did go East on leave two years ago to see my mother, but in addition saw only Pete Gaillard at that time."

I told Doc that across the bay in Berkeley he would find a classmate, Ed Tolman, XIV, who has been a professor of psychology at the University of California for many years. The other welcome note came promptly from Louis Grandgent, IV, for many years in the Washington, D.C., office of the United States Housing Authority but now having an office in the Electric Building, Fort Worth, Texas. He wrote: "Thanks for your letter putting me in touch with the M.I.T. Alumni Club in Dallas and giving me the address of George Watson, IV, in Houston. Apart from my job as regional technical adviser for U.S.H.A., my present news report is as follows: (1) son, Roland, is a freshman at M.I.T., enrolled in aeronautical engineering; (2) daughter, Antoinette, was married in Washington, D.C., on December 26, to William G. Herzl of the University of Kentucky, bureau of business research, and residing in Lexington, Ky."

Charlie Williams, V, chairman of the board of Thomas A. Edison, Inc., West Orange, N.J., spent three weeks in Cuba in late February and early March and therefore couldn't attend the Compton decennial dinner dance. Mrs. Williams accompanied him on his trip. — Charlie Maguire, I, of Providence at-

1911 *Continued*

tended a conference of the Holy Cross alumni in Worcester. — In mid-March, Erwin Schell '12, Head of the Business and Engineering Administration Department at Tech, spoke in Worcester before the industrial foremen and executives club of the Young Men's Christian Association on "Looking Ahead with Management." They invited me as a guest, and I had a grand renewal of acquaintance with him — providing an unexpected musical introduction for him, featuring some of the old Tech Show music he and I used to write "back then!" Weenie and I used to do a two-piano act in the old Union on Trinity Place — remember?

It snowed in Worcester on Good Friday, but when these notes appear spring will really be in bloom, and that's the time to give serious heed to getting back to Tech for Alumni Day, Monday, June 3. I shall hope to see many of you there. In the meantime put on your thinking caps and decide what you'd like to do on our thirtieth reunion in June, 1941. Then take out your pen or buzz for your secretary and write to Dennis! — ORVILLE B. DENISON, *Secretary*, Chamber of Commerce, Worcester, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1912

At the anniversary testimonial dinner for Dr. and Mrs. Compton, held at the Waldorf-Astoria in New York City on March 5, we mustered a party of ten at the table reserved for this Class. Present were Mr. and Mrs. George H. Rhodes, Mr. and Mrs. Cecil B. Vaughan, Mr. and Mrs. Page Golsan, and four stags — Harold H. Griffin, Ernest W. Nicholson, Robert J. Wiseman, and David J. McGrath.

Good news for classmates who like to keep track of other members and have correct addresses available for Christmas cards and other purposes: Page Golsan has offered to repeat the job of preparing an up-to-date roster of the Class — a job he did so well five years ago. As soon as the Institute's new "Register of Former Students" is off the press, Page will make up our new list and send sheets to every member. We urge you to co-operate with Golsan. When you get your sheet, please take the necessary time to check your own address and any others of which you have accurate knowledge, and return the sheet to Golsan at once.

Eugene T. Marceau, X, writes: "A little over a year ago Lever Brothers Company acquired the soap business of Hecker Products Corporation. As a consequence I have been in Cambridge since last summer. Under the circumstances it will be in order for you to cross my name from the list of 1912 Alumni located in the New York area." Eugene can be addressed care of Lever Brothers Company, Cambridge, Mass. — A letter from Cornelius Duyser, XI, New Hartford, Conn., apologizes for his long silence. Since June, 1938, he has been with the Connecticut Department of Public Works and is in the process of

finishing up a \$20,000,000 program of state improvements. He will be glad to see anybody who gets near New Hartford, as he says 1912 men are scarce in that locality.

E. H. Schell, Head of Course XV at the Institute, recently spoke before the industrial foremen and executives club of the Worcester Young Men's Christian Association. His speech received very favorable comment from the Worcester *Telegram*, as he went into the economic situation quite thoroughly, explaining some of the little-understood causes of our present economic upset. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown, Mass. DAVID J. MCGRATH, *Assistant Secretary*, McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N.Y.

1914

At the Hotel Waldorf-Astoria in New York on the evening of March 5, the Technology Club of New York tendered President and Mrs. Compton a dinner in honor of the tenth anniversary of their acceptance of an offer to come to the Institute as its president and first lady. As is usual, 1914 had one of the largest, and certainly most enthusiastic, groups present. First we met in the foyer for a real '14 get-together, then started the class cheering at the dinner, and finally enjoyed a real class party in the Sert Room. Classmates taking part were George and Mrs. Whitwell, Captain and Mrs. Richey, Herman and Mrs. Affel, Homer and Mrs. Calver, Mary Plummer Rice, Ross Dickson, Art Peaslee, Bert Hadley, and your Secretary and Mrs. Richmond. We also had with us Mr. and Mrs. Malcolm G. Wight '06 of Hartford. A business engagement unfortunately prevented Charlie Fiske from being present.

It was grand to see Bert Hadley down from Bridgeport, particularly in view of his recent honor of being elected a term member of the Corporation. Captain Richey and Mrs. Richey displayed their usual graciousness and started plans for Alumni Day in June, urging your Secretary to make sure that all '14 men were notified that our twenty-fifth reunion will continue to be celebrated again this year on that day — June 3 — so that we may dispose of any unfinished business remaining from a year ago.

Your Secretary has recently sent out several letters asking that the recipients consider themselves a committee to send in news regarding classmates. Writing up these notes nine times a year is a pleasant task, but without help from the rest of the Class they are bound to become monotonous. Let's liven them up with a word from every '14 man! A card or a clipping about yourself or any classmate will help a lot. How about it?

Leigh S. Hall of Concord, N.H., in addition to being the first from our Class to have a son graduated from the Institute, finds time for several local civic activities. For example, besides being president, for the past six years, of the New Hampshire Automobile Dealers

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Association, he is now president of the Concord Rotary Club. — Two lieutenant colonels from majors! Bill Lucas, Jr., has been upped in the Army and is now at Fort Leavenworth, Kansas, while Lucian Burnham has received his promotion in the Marine Corps and is stationed at Quantico, Va. — Hardly a reference to mass production of airplanes appears without some mention of Donald Douglas. It is, accordingly, not surprising to learn that the Institute of the Aeronautical Sciences has bestowed upon him the 1939 Daniel Guggenheim Medal.

Your Secretary had the pleasure of a call recently from Roy Parsell, who is with the Winchester Repeating Arms Company of New Haven. Roy reports a lot of business at hand. George Whitwell was also in Cambridge recently to attend the quarterly meeting of the Corporation and a meeting of the newly created Alumni Fund Board of which George and your Secretary are members. — H. B. RICHMOND, *Secretary*, General Radio Company, 30 State Street, Cambridge, Mass. CHARLES P. FISKE, *Assistant Secretary*, 1775 Broadway, New York, N.Y.

1915

Back to Tech for our twenty-fifth reunion! Only thirty-one days left. By now you all know the program, but for emphasis let me recall it to you: All classmates in the vicinity of Boston will meet Friday, May 31, between twelve and one o'clock at 1915 class headquarters in the main building at the Institute and will go by automobile directly to the Oyster Harbors Club, Osterville, Mass. (on Cape Cod). Classmates leaving from other points should plan to arrive at the Oyster Harbors Club in time for the informal dinner on Friday at 6:00 p.m. We shall stay at Osterville until Monday morning. This part of the reunion is *stag*. Leaving the cape we drive to Cambridge on Monday morning and will meet lady guests of the Class at our headquarters room at noon, when we shall all have lunch at Du Pont Court at Technology. After lunch come Class Day exercises at the Institute, and then with the ladies we go over to the class cocktail party at the Hotel Statler, Boston, from four to six. The ladies will go to dinner at President Compton's house while we attend the Alumni dinner at the Statler. The ladies will rejoin us after their dinner for a farewell in the 1915 class cocktail room in the Statler.

This is going to be a wonderful reunion. The unusually low price of \$19.15 is made possible by the contributions of generous classmates. Just think what this means. It includes your five-dollar ticket for Alumni Day and the price of your wife's lunch and dinner! If you have already bought your five-dollar Alumni Day ticket, the price will either be refunded by the Class or deducted from your reunion charge. If you haven't bought it, we will pay for your ticket. Of course you understand we are buying tickets only for those classmates who attend the reunion. In March, when these notes were being written, we had 65 affirmative,

1915 Continued

22 doubtful, and 55 negative replies. To make our reunion successful we should have 100 men. Plans and preparations have meant a great deal of work and time, but the committee has co-operated most heartily. The boys in New York have gone to work with a will. If the rest of you feel the way we do, you can hardly wait!

Loring Hall, in Detroit, writes: "I met Arthur Ball out in Los Angeles when I was there last month. As you may know, he resigned from Technicolor in order to accept an executive position with Disney Productions. He was kind enough to arrange a tour for me through the new Disney studios, which provide every facility for the making of modern cartoon pictures. The amount of work that goes into one of the feature-length cartoons is almost unbelievable. I asked Arthur if he was going to be able to get to Boston for the reunion. He said he should like to but didn't think he could make it this year. He wanted me to give you all his best regards."

Then Loring Hayward from Taunton, Mass., with a touch of his inimitable wry wit, pens us thusly: "I am one of those old-fashioned fellows who get married and assume the responsibility of bringing up their children. . . . At the moment, I have a boy and girl in college, and any spare change has to go in that direction for three or four years more, possibly ten, if they don't make better progress than I did. I hope to come to Oyster Harbors the first of June for the fishing."

I simply cannot keep from referring to the reunion and I want to say that the keymen in the geographical centers are doing a wonderful job in going after the men in their territories. Ken Boynton wrote that he hopes to get here from Mexico City. If he does, he should win the valuable and dignified prize for this honor. — The Class slogan, "Help Azel," has certainly produced results. See you at Oyster Harbors! — AZEL W. MACK, Secretary, 40 St. Paul Street, Brookline, Mass.

1916

Henry Shepard left on March 23 for an extended trip in the South. He called it a business and pleasure trip. He planned to cover not only the central part of the United States but the Pacific Coast as well. Henry stated: "When I get through with any particular distributor, I am usually so tired that I don't have the energy to look up old friends." It looks to your Secretary as if Shepard is letting old age get the better of him.

Earle Carver Pitman, X, of Red Bank, N.J., was given an award as Modern Pioneer by the National Association of Manufacturers at a dinner in New York on February 27 for his part in the development of Duco finish and similar lacquers. He is the holder of twenty-one patents and has been associated for twenty-one years with E. I. du Pont de Nemours and Company. He is assistant director of their laboratory at Parlin, N.J. — Ralph Fletcher and his wife have been spending a good deal of time at

Tollman's in Cheshire, N.H., where both have done considerable skiing this winter. — JAMES A. BURBANK, Secretary, The Travelers Insurance Company, Hartford, Conn. STEVEN R. BERKE, Associate Secretary, Coleman Brothers Corporation, 245 State Street, Boston, Mass.

1917

The March issue of the *Architectural Forum* contains a page of drawings by Harold Stern, illustrating what the *Forum* terms his "revolt" against both the conventional measured drawing and the free rendering. "The former, usually in line, records facts but not the spirit. The latter essays an effect of drama and falls short of being a true record. Architectural engravings and lithographs of a century or more ago, combining the two purposes, prompted his [Stern's] efforts to record for future generations certain examples of American architecture which for one reason or another have been overlooked. . . . Stern has worked in the offices of Delano & Aldrich; McKim, Mead & White; and Pennington & Lewis, and for the last eight years has practiced under his own name."

Nig Sewall writes: "My enthusiasm for skiing got the best of me this winter, and, as a result, I am now pounding around on crutches, waiting for a fractured leg to heal. Otherwise I am hale and hearty." — Irving McDaniel, who belongs to our Class, as well as to 1915 and 1916, became a grandfather on March 10 with the arrival at Arlington, Va., of Katharine Nelson in the household of Mac's daughter, Josephine. As far as we know, the Class does not possess other candidates for what the society columnists term grandparent honors. — Linwood Noyes, together with his father, was recently initiated into Sigma Delta Chi, national professional journalistic fraternity, at the Inland Daily Press Association meeting in Chicago. Lin is a past president of the Inland and is editor and publisher of the Ironwood, Mich., *Globe*. His father is editor and publisher of the Marinette, Wis., *Eagle-Star* and a graduate of the University of Wisconsin in 1878.

Arthur H. Paul, who lives in Morrisville, Pa., has since 1923 been vice-president of the Chandler-Paluba Company, manufacturers of felt-base floor coverings for Congoleum, Armstrong, and others. Paul's son, Edwin, is a lower middler at Exeter, and his daughter is at the George School.

Lyman Medding, a major in the Corps of Engineers, recently wrote: "I have moved around considerably since leaving school. For brief periods I was in Fort Leavenworth, Kansas, and Vancouver Barracks, Wash.; then fifteen months in France, followed by a year each in Georgia and South Carolina with troops; then three years of Reserve Officers' Training Corps duty at the Missouri School of Mines; a year at the Engineer School in Fort Belvoir, Va., two more at the United States Engineer Office in Boston, and then four years as instructor of engineers, Massachusetts National

Guard, Cambridge. For the last eighteen months I have been at Memphis for duty on the river." Lyman should be addressed at Post Office Box 97, Memphis, Tenn. — RAYMOND STEVENS, Secretary, 30 Charles River Road, Cambridge, Mass. PHILIP E. HULBURD, Assistant Secretary, Phillips Exeter Academy, Exeter, N.H.

1918

Classmates may be wondering what has become of Sherman MacGregor. Here comes the news by way of the National Broadcasting Company: "Sherman MacGregor, N.B.C. production director, made his first appearance on the stage at the age of three. His big (and only) scene took place as he sat in a high chair and, at a given cue, dropped a spoon on the floor. The cue, incidentally, was a poke in the ribs by a more mature member of the cast. MacGregor's career has followed dramatics in one form or other ever since. He joined the staff of N.B.C.'s Station KDKA in Pittsburgh in 1929 and then came to the New York office of the company as production director in 1936.

"Even before he definitely plunged into radio, however, MacGregor's life was theater in one form or another. As a second lieutenant with the United States Army in France, he served as camp entertainment officer in the base camp in Saint-Nazaire and organized a camp orchestra and band. After the war he was chief engineer in charge of construction for a large contracting firm, but he says, 'I was interested in dramatics, and produced and acted in a great many plays whenever time permitted.' At N.B.C. today, MacGregor's work primarily is concerned with direction. He produces 'Renfrew of the Mounted' and 'The Parker Family,' popular serial sketches; 'The World Is Yours,' a public service feature; 'Human Nature in Action,' a social psychological study; and 'Magic Waves,' a program explaining the wonders of physics in radio."

In the middle of the amazing ice storm which we had in this locality in early March, the Technology Club of New York had their annual dinner in honor of President and Mrs. Compton. Our Class didn't show up in very large numbers at that time. Those present were Mr. and Mrs. Saxton Fletcher, Mr. and Mrs. Thomas Brosnahan, Mr. and Mrs. William Neuberg, and yours truly. I think Mrs. Fletcher and I went there to get warm, as our homes were without heat or light for two days before the dinner and for some time thereafter. Here at school, we camped for four full days, cooking over fireplaces for twenty persons. In the woods, camping may be fun but not in the middle of a civilized neighborhood. Destruction of trees was about as bad as at the time of the hurricane, and here the upset to wires was much worse than it was in September of 1938.

The following announcement came to me recently: Effective January 1, Alan B. Sanger and Keith B. Lydiard announce a dual personal service. "Complementing one another in personal advertising and sales-promotion counsel to industrial and

1918 *Continued*

trade advertisers with limited budgets or to large advertisers desiring this kind of outside service," so the circular reads. Congratulations, Pete!

Our well-known Class President got himself headlined on the seventeenth page of the *Boston Herald* on March 13: "Prof. Magoun Says New Deal Fosters Foreign Ideologies." Maggie was speaking and answering questions after a luncheon meeting of an all-day institute of the Child Study Association of America. "Continuance of the Roosevelt administration's vacillating attitude in coping with some of the nation's serious problems can lead only to an increased growth of foreign ideologies in the United States. Throughout history it has been demonstrated that failure to face a fact doesn't alter the fact. The great struggle of the civil war might have been averted if some of the statesmen of an earlier era had been able to face facts. If President Roosevelt persists in certain things he is doing, we will have foreign ideologies here. Roosevelt has engineered many compromises that took our attention away from those problems facing us in 1932. He has put our financial status in terrible shape, and we must inevitably face a showdown. You may not like what I'm saying, but I think I'm right and that history will bear me out, if things continue as at present."

To quote from the *Herald*: "Magoun's brief passing remarks on the present state of national affairs were greeted with scattered shouts of 'You're right!' from the more than 350 present." — Will the members of the Class please send in notes about themselves and about any of the other members of whom they may know? — GRETCHEN A. PALMER, *Secretary*, The Thomas School, The Wilson Road, Rowayton, Conn.

1919

Your Secretary was in Texas during the first half of March and therefore was unfortunate enough to have missed the New York Technology Club's dinner held on March 5 in honor of Dr. Compton. Alex Wiren was active in promoting the publicity for this affair, and I found a letter from him on my return from the South. I trust that with his efforts our Class was well represented. — I had a note from Ted Hill from Bolling Field, District of Columbia, stating that he had run into Ed Rounds at the Anacostia Naval Air Station a while ago. Ted would like to see any of the boys who happen through Washington.

L. A. Jackson, manager of the Little Rock Municipal Water Works, Little Rock, Ark., writes: "After being graduated, I barnstormed around the country a little bit, working in different lines, and finally landed down here in 1924 in the capacity of a traveling engineer for the American Water Works and Electric Company. In 1936 the city bought the plant, at which time I was elevated from the position of assistant manager to that of manager. The operation of a city water-supply business is not a very fascinating one, but it does furnish a very

fine association with a group of water-works men who, on the whole, are a swell bunch of fellows. It also furnishes the usual problems, technical and otherwise, that come up from day to day in furnishing a community of 100,000 people with a potable and safe water supply. So with a wife and two 'hungry' girls, nine and thirteen, I consider myself very fortunate to be able to provide for them and reside in a community that I have learned to love well. My only regret is that I do not have the opportunity to get back East and visit with my friends and school, the memories of which mean so much to me."

Dudley B. Murphy now lives at 1414 North Havenhurst Drive, Los Angeles, Calif. — Dick Holmgren writes: "I am now located in Concord, N.H., as chief engineer of the New Hampshire Water Resources Board. Our work consists of building structures to improve the use of the water resources of the state. We are just completing a large dam on the Connecticut River at Pittsburg, creating a reservoir of 96,000 acre-feet. The dam is about 2,200 feet long and 100 feet high. This job has kept me pretty busy during the past two years. We are looking forward to constructing similar dams in other parts of the state in the near future. I am married and have three children: two boys, George and Richard, aged twelve and thirteen, and one girl, Sandra, three and a half. My hobbies at the present moment consist of skiing during the winter and sailing during the summer. Thus far I have broken no bones from my skiing and seem to be progressing rather rapidly in this art. My sailing is done at Marblehead, where I am a member of the Boston Yacht Club. I have a small town-class boat in which I enjoy racing out of Marblehead during the summer. There are no members of our Class living in the vicinity of Concord.

The only contacts I have with Technology men are the annual reunion of the New Hampshire Tech Club and Alumni Day at Cambridge, which I try to attend. . . . I am looking forward to seeing you and the rest of the fellows at Alumni Day on June 3."

John Meader delivered a talk on "Some Economic Factors in the War" on February 29 to the British Schools and University Club. I had the pleasure of reading Jack's speech and must say that it certainly contained some very interesting and important statistics and analyses of the present war.

Don Kitchin's son Robert, who is sixteen, is planning to enter M.I.T. — not Tufts, as reported in the March notes. Bob has Technology banners all over his room and has attended every public lecture at Tech this year. Don has seen George McCreery, who has a boy thirteen and a girl two and a half. George gave several lectures at the Institute on estimating practice. Don Kitchin has been delving into the musical field and has given a talk on music with records of Bach, Brahms, and Wagner. He has a homemade radio set which gives much better sound reproduction than do com-

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mercial sets. His older son, Don, Jr., had his picture in the *Boston Evening Transcript* on Saturday, March 16. Don, Sr., apparently went swimming until December 15. I have not figured out whether this was outdoors or indoors, but it sounds as though he is one of those big, strong he-men who break ice and then jump in for a plunge. — The Secretary would be glad to have classmates phone him at M'Ohawk 4-0930. — EUGENE R. SMOLEY, *Secretary*, The Lummus Company, 420 Lexington Avenue, New York, N.Y. GEORGE W. McCREERY, *Assistant Secretary*, 275 Cypress Street, Newton Centre, Mass.

1920

Pete Lavedan, chairman of '20's twentieth reunion committee reports an exceedingly enthusiastic and well-attended gathering at the M.I.T. dinner at the Waldorf-Astoria, March 5. The following were present and most of them promised faithfully to be on deck at the Sheldon House, Pine Orchard, Conn., to start June off right: Mr. and Mrs. Edwin S. Burdell, Mr. and Mrs. Pierre F. Lavedan, Mr. and Mrs. Philip J. Byrne, Jr., Mr. and Mrs. William T. Hedlund, Mr. and Mrs. Laurence E. Weymouth, Mr. and Mrs. Frank L. Bradley, Stanley C. Reynolds, Francis L. Mead, Mr. and Mrs. John M. Nalle, Mr. and Mrs. George F. DesMarais, Malcolm S. Burroughs, Charles George Dandrow, James W. McDonald, Jr., Alfred T. Glassett, and Joseph Givner.

It is time to be making definite plans for the reunion; so if you have any questions about it or how to get there, drop Pete Lavedan a note, care of the Liquid Carbonic Corporation, 52 Vanderbilt Avenue, New York City. — HAROLD BUGBEE, *Secretary*, 7 Dartmouth Street, Winchester, Mass.

1921

Just about a month to Alumni Day on June 3 — the annual Trek to Tech and a real good time. Will you be there? — Victor E. Stevenson, III, is chief mining engineer of the Lautaro Nitrate Company, Ltd., Oficina Pedro de Valdivia, Antofagasta, Chile, S.A. According to a note from Charlie Locke '96 the company produces about 600,000 tons of nitrate a year, and as one of his responsibilities Vic has supervision of all the engineering work at the Pedro de Valdivia plant in connection with preparation of new ground and moving daily loads of 25,000 tons of ore and 15,000 tons of waste overburden.

Roderick K. Eskew, X, 120 Chatillon Road, Rome, Ga., writes via Ray St. Laurent that he is assistant chief chemist of the Tubize Chatillon Corporation. Prior to his present position Rod was with the Brown Company in a technical service capacity in the pulp sales division. He traveled extensively and represented the organization in Japan during 1936 and 1937. Before going to Brown in 1934, he was with the Du Pont Viscoloid Company and until 1925 was with the Hercules Powder Company. Rod is married and has one youngster.

1921 Continued

Thomas P. Campbell, XIV, has found it necessary to enlarge his office facilities and has moved his organization to 1024 Patterson Building, Denver, Colo. He is president of the Campbell Investment Company. — Axel G. H. Andersen, III, of Phelps Dodge Corporation, Long Island City, N.Y., has continued his studies and now, sporting the title of "Dr.," Andy makes his home at 34 Remsen Street, Brooklyn, N.Y. Douglas W. Coe, XIII-A, has been promoted from lieutenant commander to commander, United States Navy, and is stationed at the Electric Boat Company, Groton, Conn. The promotion of John P. Dean, I, from captain to major, United States Army, has also been announced. Major Dean is at the United States Military Academy, Quarters 43, West Point, N.Y.

Henry R. Kurth, VI, has been nominated as the representative of the Class to serve for five years on the Alumni Council. Chick is assistant chief of electrical operations at the Boston Edison Company and lives at 8 Healey Street, Cambridge. — G. Everett Farmer, VI, writes from 25 Asbury Drive, Chattanooga, Tenn., that he is busy with the extensive communication facilities of the Tennessee Valley Authority, for which he is communication engineer. Gef says the T.V.A. operates some twenty-seven power-line carrier-telephone systems, thirty-eight pilot relay carrier channels, and about a thousand miles of open-wire telephone line.

David O. Woodbury, VI-A, author and playwright of Ogunquit, Maine, continues in the limelight. His book, *The Glass Giant of Palomar*, published last fall by Dodd, Mead and Company, received many complimentary reviews, particularly those in the *New York Times*, the *New York Herald Tribune*, and the *General Electric Review*. Dave frequently writes short popularized accounts of scientific research, such as his recent one, "Breaking the Heart of the Atom," which appeared in *This Week* magazine. He is spending the winter in California collecting material for a new book on the hydroelectric projects in the West, and we hope he hasn't forgotten his promise to prepare a special autobiography for these columns. We extend sincerest sympathy to Dave on the recent passing of his father, Charles H. Woodbury '86, the internationally known artist and founder of the group at Ogunquit.

New addresses of the month include those of Frederick W. Binns, X, 192 Manning Street, Needham Heights, Mass.; Richmond S. Clark, X, Humble Oil and Refining Company, Baytown, Texas; John J. Colleran, I, 7 Gardner Terrace, Allston, Mass.; Frederick J. Curtin, I, 1227 2d Street Southwest, Rochester, Minn.; T. Dillwyn Dutton, VI, 50 Upland Road, Upper Darby, Pa.; Edward M. Epstein, X, Du Pont Rayon Company, Richmond, Va.; S. Paul Johnston, II, National Advisory Committee on Aeronautics, Navy Building, Washington, D.C.; Commander James L. King, II, 150 South Los Robles Avenue, Pasadena, Calif.

Also recently relocated are James Le-Grand, I, 242 Bronxville Road, Bronxville, N.Y.; Alexander M. McMorran, II, 24 Yale Avenue, Warwick, R.I.; Dr. David R. Merrill, X, Rohm and Haas Company, Inc., Post Office Box 219, Bristol, Pa.; Grant L. Miner, Jr., I, 1218 East Cedar, Denver, Colo.; Robert D. Moore, II, E. I. du Pont de Nemours and Company, Inc., Wilmington, Del.; Charles H. O'Donnell, II, 17 Webster Road, Milton, Mass.; Lieutenant Colonel Holland L. Robb, I, 317 Broxton Road, Baltimore, Md.; Antonio H. Rodriguez, X, Calle 23, No. 1002, Vedado, Habana, Cuba; Louis D. Striebel, II, Rural Route No. 1, Benton Harbor, Mich.; Dr. George Thomson, X, 1031 Metropolitan Avenue, Milton, Mass.; Michael Treschow, XIII, 447 Bentley Avenue, West Los Angeles, Calif. — Well, what's your news? — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, Manchester Conn. CAROLE A. CLARKE, *Assistant Secretary*, International Telephone Development Company, Inc., 137 Varick Street, New York, N.Y.

1922

As you may have seen, on page 245 of the April issue of *The Review*, Frederick H. Untiedt was honored as a Modern Pioneer by the National Association of Manufacturers' committee headed by Dr. Compton. The award was made for his invention of rubber latex foam used for mattresses and as a cushioning material in automobiles, airplanes, trains, and so on. As Fred is by profession a patent lawyer, the ingenuity that resulted in this award seems somewhat unorthodox: Patent lawyers are supposed to exist for the benefit of their clients — not to make inventions themselves. Something should be done about this. — From Don Carpenter comes word that George O. Clifford has recently been appointed works manager of the Ilion, N.Y., works of the Remington Arms Company.

The December 1 issue of *Sales Management* told what a fine job Al Browning is doing as president of United Wallpaper Factories, Inc., of Chicago. Last year the company sold 75,000,000 rolls of wallpaper but managed to lose \$215,000 on this business. Since then Course XV, in the guise of Mr. Browning, has taken the situation in hand, and sales and profits are up substantially. The company, under Al's leadership, is now embarked on a campaign which, with improvements in styling, designing, and sampling, plus consumer and dealer advertising, calls for an appropriation of over \$800,000, which sounds like pretty big business. When we see the advertisements of Unitized wall-papers in *Collier's*, *Good Housekeeping*, *Better Homes and Gardens*, and *American Home*, we can feel that Al is doing his part to keep our walls artistically and economically covered. — Bill Bainbridge is still on the job with the United States Gypsum Company, doing promotional and merchandising work all over the country, with particular emphasis on asbestos and cement shingles.

(2)

An article in the *New York Times* (January 28) about the additions to the staff of Brooklyn College makes reference to the appointment of Alfred J. Maria as instructor in mathematics. Maria was in Course X and, after receiving his degree from the Institute, earned his master's and doctor's degrees from Rice. He has been a fellow at Princeton and an international research fellow at the University of Göttingen. In addition, Maria has taught at Illinois and Duke universities.

Lee Carroll, of the investment securities firm of John B. Carroll and Company in New York, is considered an authority on municipal bonds, having done much work in this field and having written extensively on the subject. In the Montclair, N.J., *Times* of February 2 appeared an exceptionally pertinent article by Lee relating specifically to the situation which prevails in Montclair but which is probably typical of many communities the country over. The gist of the article is that under present conditions truly economical management of municipalities cannot reduce expenses to the taxpayer's ability to pay, and that the best solution is to increase the number of taxpayers — for instance, by permitting the building of suitable apartment houses. Municipalities should re-examine their zoning laws with a view toward making this increase in ratables possible. This would be, in effect, a broadening of the municipal tax base. Lee's argument is particularly timely.

You read in the April Review (page 241) that at the dinner for Dr. Compton on March 5, George Dandrow was chairman of the committee in charge and also served as toastmaster, and that Eric Hodgins, maintaining his usual high rhetorical standards, was one of the speakers. The affair drew a large gathering, and it is reported that our Class had the largest attendance. Some came with their wives, some alone. Those in the first group were Cadwallader F. Blanchard, Charles J. Burke, Charles George Dandrow, Howard J. Duge, Thomas H. Gill, John F. Halpin, Latimer F. Hickenell, Edward Masterson, John C. Molinar, William H. Mueser, James Nesmith, 2d, Samuel H. Reynolds, Dale D. Spoor, and John H. Teeter. The unattached gentlemen were Nathan Cherniack, C. King Crofton, H. Morton Cronk, Harrison D. Folinsbee, Eric F. Hodgins, Francis M. Kurtz, Duncan R. Linsley, Ronald G. MacDonald, Lachlan MacKenzie, Charles T. McGrady, Harold Judd Payne, R. A. Stone, and Sydney M. Strauss.

We are glad to record the birth of a first child, David Hemeon, to Mr. and Mrs. Godfrey B. Speir. David is particularly a Technology offspring because his uncle is Gus Hemeon. Speir reports that he is still doing the patent work for Curtiss-Wright Corporation and the Wright Aeronautical Corporation, and that he lives at 39 Henry Street, Glen Rock, N.J., not far from Paterson.

Last December at a dinner meeting of the Class at the New York Tech Club, there was some general discussion of the

1922 *Continued*

desirability of having an informal reunion on June 2, the day before Alumni Day. As there has always been a fair-sized group of 1922 men returning for the general reunions, the New York group has proposed, and Boston concurs, that those who are planning to come for Alumni Day this year could just as well come somewhat earlier, say Saturday night or early Sunday morning. We could have a round of golf at some one of the local clubs and finish the day with supper and a beer or two at some convenient place, either the golf club or a restaurant in town. There is nothing official about this suggestion. It is, however, a meeting which we hope you will want to attend. The spirit in which this is conceived is (as the story goes) one of hearty co-operation, not grudging acquiescence. The only cost involved will be the greens fees, food, and drink.

The Hotel Kenmore is designated as 1922 headquarters for this informal reunion. Those who plan to be on hand on June 2 will meet there in the morning between ten and eleven o'clock. We shall then proceed by automobile to a local golf club for eighteen holes of golf. This will be followed by the informal dinner in the evening. A five-dollar bill ought to cover the day's activities. Transportation will be provided by the Boston contingent if those of you returning without cars will let us know. Please inform the Assistant Secretary immediately if you plan to attend. It is important to know the number who plan to play golf, since the courses are all pretty busy at this time. — CLAYTON D. GROVER, *Secretary*, Whitehead Metal Products Company, Inc., 303 West Tenth Street, New York, N.Y. C. YARDLEY CHITTICK, *Assistant Secretary*, 77 Franklin Street, Boston, Mass.

1923

Howard V. Shipley is president and managing director of the Canadian Ice Machine Company, Ltd., of Toronto. He writes: "After leaving M.I.T. in 1923, I joined the Boston office of the York Ice Machinery Corporation. In 1930, I was transferred to the New York office and for several years acted as sales manager for that office. In 1937, I was transferred to Rochester, N.Y., where I acted as general manager, taking care of all New York State (except Metropolitan New York), part of Pennsylvania and New England. Last year I had an opportunity to purchase controlling stock in the Canadian company of York Ice Machinery Corporation, which operates in Canada under the name of the Canadian Ice Machine Company, Ltd. I have run into two 1923 M.I.T. men: one, Frank Archer who operates his own company in Kingston, Ont., and acts as our distributor for the sale of commercial refrigeration, air conditioning, and domestic oil burners; the other, Hugh D. Nickle, who is with Combustion Engineering Corporation, Ltd., making his headquarters in Montreal."

Gilbert Nelson Reed writes: ". . . I took up law after my year at Tech, served for about fourteen years in the New York

law department for the New York, New Haven and Hartford Railroad Company, then spent a year in private practice in Brooklyn. Last August my wife and I moved to Pittsburgh, where I am situated in the law department of the Westinghouse Electric and Manufacturing Company."

A few days ago I received a large newspaper about the size of the Sunday editions. This turned out to be a copy of the *Laurel Leader-Call* which had the imposing title "Chemurgic Trek and Pilgrimage Edition." It was all about the developments in chemurgy in Laurel and other data boosting the community as a place to visit. I found among its pages a picture of Basil O. Stewart, assistant director of research at the Masonite Corporation plant. Shortly thereafter I had a letter from Stewart in which he said: "I mailed you a copy of the chemurgic edition of our local paper the other day with the thought that you might be interested in the effort of a little sawmill town to keep its head above water as the supplies of virgin timber melted away. Laurel at one time was the center of the yellow-pine industry and with its six large sawmills produced several million feet of lumber a day. Of those six large mills, only one is cutting now and it is working mostly all hardwood; the long-leaf yellow pine is now practically all gone. Mrs. Stewart and I came to Laurel in 1929 after spending five very enjoyable years in Cuba. I worked in a sugar mill there, but had the good luck to get out of the business before the bottom dropped out. We have two sons: Robert, aged eight, and John, aged six. I have been working for the Masonite Corporation since 1929 with the doubtful distinction of being the first research chemist employed. We have a research staff of about forty men, all of whom are graduate chemists."

Benjamin Carpenter '18 of Lake Forest, Ill., reports that Charles H. Robinson died in February. — HORATIO L. BOND, *Secretary*, 457 Washington Street, Braintree, Mass. JOHN M. KECK, *Assistant Secretary*, 441 Mount Prospect Avenue, Newark, N.J.

1924

Our best-known flying classmate, Jimmie Doolittle, was elected president of the Institute of the Aeronautical Sciences at a meeting held in January at Columbia University; the Class adds its congratulations to the sheaf of others he has received.

Al Glassett, President of the Technology Club of New York, reports that '24 provided one of the largest class delegations at the March dinner held to honor Dr. Compton. Under the leadership of Bill Correale and Anatole Gruehr, more than thirty attended. The New York Club, by the way, is well worth a visit since, in addition to all the facilities of a fine club, it offers an opportunity to spend an evening in the company of other Institute Alumni.

Addition for your calendar for Alumni Day, June 3: Chick Kane, recently appointed by the Institute to serve its fund-

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raising activities and by the Alumni Association to direct the Alumni Fund, will hold open house in his office, Room 5-115, for members of the Class. Be sure to stop in there and register yourself.

Included among those who had by March 27 either made reservations for, or asked for further information on, Alumni Day are the following: Russell W. Ambach, Avery A. Ashdown, Francis A. Barrett, Edward F. Britt, Elbert C. Brown, Thomas F. Bundy, Candelario Calor Mota, William B. Coleman, William H. Correale, Charles O. Duevel, Jr., David Evans, Jr., J. Earl Frazier, Myron F. Freeman, Harry R. Hammond, George J. Harrington, Gertrude G. Harris, Harold L. Hazen, John Early Jackson, Donald B. Jennings, Gordon C. Joyce, Hayden B. Kline, Israel J. Korn, G. Raymond Lehrer, James B. MacLean, Henry J. MacMillan, Anthony D. Matarese, Perry C. Maynard, Edward H. Moll, Herbert C. Moore, Joseph M. Naughton, Robert E. Reid, Richard F. Shea, Baird Snyder, 3d, Herbert R. Stewart, George P. Swift, Louis Tanner, Edward S. Taylor, Richard H. Walker, Walter R. Weeks, and Harrison G. White. — FRANCIS A. BARRETT, *General Secretary*, 50 Oliver Street, Boston, Mass.

1925

First, let me remind you that the reunion date is about a month from the time you will receive this issue of The Review. So if you have not completed your plans for attending, you'd better do so at once.

The March issue contained the news of Charlie Norton's engagement to Dr. Josephine Hopkins. The wedding took place on Saturday, February 3, in St. Ignatius Episcopal Church in New York. The couple will live at 157 East 64th Street, New York City.

We also had news of Augusto Bruna in the March issue. Doc Foster has received from Professor Locke '96 a copy of another letter from Bruna, in which he says: "Life in London continues with the same restrictions I told you about in my last letter and a few more restrictions that have been added in the matter of rationing, but please do not for a moment think that the rationing means that we go hungry sometimes. On the contrary, there is too much of everything. I had the opportunity recently to make a short visit to Madrid, a city which I had not seen since 1935. It was impressive to see such wholesale destruction everywhere. Entire suburbs, especially in the working-class sectors, are completely destroyed, and scarcely any reconstruction work is going on. This latter fact you come to understand when you are told that there are about 500,000 men in prisons and concentration camps, about 200,000 exiled in France and in South American countries (Chile has its share of about 3,000), and several hundred thousand still in the army. If to these figures you add a million killed during the war, it is easy to understand that there are not many left for an intensive reconstruction of the country. There are great poverty,

1925 Continued

high cost of living, and scarcity of many of the essentials. As long as you stay inside a big hotel, however, you cannot observe any of these things. Of course, travel abroad is not easy or too comfortable, because of the many permits and inspections required and the entire subordination in railway services of the passengers vis-à-vis the military requirements."

In addition to the letter which follows, Geoff Roberts more recently sent me some magnificent photos of scenes in the Transvaal. Since we can't publish them here, I'll bring them to the reunion, where they will be passed around. Here is the letter: ". . . Yes, I guess you will have to count me out at this year's reunion, much as I should enjoy meeting again some of my old friends of Technology days. About the only one with whom I am still in touch is Charlie Boardman of Pittsburgh. I used to have a letter occasionally from Alfred Kullman, who is now in Cincinnati, I believe. I have altogether lost track of my old lab partner, Bob Quinn, who was in the insurance business in Mansfield, Ohio, when I last heard from him. Glen Bate man is, of course, still in Johannesburg, but I have not seen him for a couple of years. He is a terrifically big chap now — must be well over the 200-pound mark. I attended an American dinner in Johannesburg a few months back and heard there that Glen had become a naturalized Britisher. . . .

"I have two cousins out here. One of them was in England when the war was declared. That dreadful Sunday in September when the news came over the radio, a cable arrived from Gordon, saying that he had joined up. The younger brother, who was out here, immediately decided that he would have to go too. He sailed from Cape Town the following Friday. The ship spent five days at Freetown, Sierra Leone, waiting for a convoy, and my cousin contracted a dreadful case of malignant malaria. He was in hospital for weeks after he arrived in England and has only recently been passed as fit by his doctor. Incidentally, this same chap, Douglas Low, was captain of the Cambridge University Rugby team that played several games in America in the spring of 1938.

"Lever Brothers has a factory at Maydon Wharf, Durban. I believe it is quite a large factory, but I have never been over it. You would find Durban an attractive town in a semitropical sort of way — green, green everywhere, with brilliant scarlet and mauve flowering trees. Durban Harbor is the busiest in the Union, and there are a number of industrial establishments in the vicinity. I suppose the most important industry, really, is providing for the visitors who flock to the town both in winter, when the climate is warm and mild, and during the Christmas holidays.

"I think Cape Town is my favorite city in South Africa. I should think Cape Town's combination of mountainous and marine scenery must be almost unequalled elsewhere in the world. The coast reminds

me much of the Californian coast around Monterey, but California has nothing so striking as the massive bulk of Table Mountain, which rises over 3,500 feet above the city. . . . I cannot leave this discussion without putting in a word for Johannesburg — a tough and materialistic town but one of which I am fond in some ways. Johannesburg may be uncultured, but no one can deny that it is energetic and progressive. . . . The concentration of wealth in Johannesburg is truly amazing. The bank clearings are larger than those in cities like Birmingham, England, and Baltimore, and very nearly equal to those in Detroit.

"Of course all this magnificence is derived from the toil of the natives, who sweat their lives out down in the mines. Well, I spent five years wandering around underground myself, so I know all about the gold mines. . . . I left the mines in April of last year and started my life all over again with a company called the Victoria Falls and Transvaal Power Company, Ltd., popularly known as the V.F.P. This is the last of the privately owned power companies in South Africa, and I believe it is to be eventually absorbed by the government-controlled Electricity Supply Commission. The Supply Commission owns the two largest power plants in the Union, Klip and Witbank, and is building the new Vaal station. All these plants are, or will be, operated by the V.F.P.

"The V.F.P. Company does have a small hydroplant at the Victoria Falls — about 15,000 horsepower — but it is not interconnected with the rest of the system and, as far as I can make out, was built only to retain a franchise at the falls, just in case. The vast bulk of the company's business is supplying power to the gold mines of the Witwatersrand. The magnitude of this undertaking is hardly appreciated even by officers of the company in England. I read an article in *Fortune* last September about the Pacific Gas and Electric Company, which, the article said, ranked about fourth among large utilities in America. I estimated roughly that the output of the V.F.P. Company was nearly as big as the P.G. and E. I forgot the figure now, but I think it was over five billion kilowatt-hours annually. Well, the company decided I needed operating experience, so they sent me first to the Klip generating station. This plant is situated on a huge seam of coal about thirty-five miles south of Johannesburg. The coal mine is owned and operated by the Springfield Colliery. The coal is carried by belt conveyor from the mine directly to the top of the boiler house, whence it is distributed to chain grate stokers firing twenty-two Babcock and Wilcox boilers. Each boiler generates 180,000 pounds of steam an hour at 350 pounds' pressure. The electrical side of the plant consists of twelve 40,000 kilovolt-ampere Metro-Vick alternators, generating at 10,000 volts. This is stepped up to 80,000 volts, for transmission to the Ruf. The plant auxiliaries are supplied by four 8,750 kilovolt-ampere house sets, generating at 2,000 volts.

"The most striking features of this plant are the ten huge concrete towers used for cooling the circulating water for the condensers. The towers are 220 feet high and 175 feet in diameter at the base. Under certain conditions enormous plumes of steam rise from these towers, sometimes forming banks of cumulus clouds before your eyes. A month or so ago I was transferred to one of the older plants on the system — Veruniging power station. This station was built by the Germans and operated by the Allgemeine Elektrizitäts Gesellschaft up to the beginning of the last war, when the V.F.P. Company took it over.

"The war has wrought few profound changes in South Africa thus far. Prices of all imported goods are rising. The 1940 cars are only just beginning to arrive and they are up something like £50. Petrol at 1/11 a gallon is up threepence and is said to be going higher. Motorcar tires are up 10 per cent. An attempt is being made to bring the South African Defense Force up to war strength by enlistment. I do not think the response has been particularly good thus far, though I know of many young men who have chucked their professions and enlisted in one unit or another. So far, no South African forces are being sent overseas, and in fact men of military age are not allowed to leave the country. If this war ever really gets under way in Europe, however, I suppose this country will also have to contribute to the slaughter. . . .

"Here's hoping the reunion in June will be a memorable occasion. Please give my kind regards to any classmates who may remember me." — Here's a hearty amen to Geoff's wish for a memorable occasion. — HOLLIS F. WARE, *General Secretary*, 3 Aquavia Road, Medford, Mass. F. LEROY FOSTER, *Assistant Secretary*, Room 6-202, M.I.T., Cambridge, Mass.

1926

The visitor of the month was Don King, late of New York and Long Island Sound, now a landlocked citizen of Charleston, W.Va. Don is with the Carbide and Carbon Chemicals Corporation, and he was here at the Institute in the capacity of an ivory hunter for his company. He used to appear regularly every year, but last year he slipped, so that this year his visit was doubly notable. Don is a sailor, and the inappropriateness of West Virginian topography for this sport apparently is not deterring him, for he is building a boat to sail upon the local river.

Maurice L. Ash, Jr., of 6535 Third Avenue, Detroit, Mich., recently patented a meter for use in enlarging photographs. This meter, which is now on the market, exposes test strips by means of a sliding shutter having a speed which varies from a fraction of a second to approximately five minutes. — Samuel G. Eskin, who is director of the research laboratory of the Robertshaw Thermostat Company in Pittsburgh, Pa., presented a paper, "Thermostatic Bimetals," before the American Society of Mechani-

1926 *Continued*

cal Engineers in December and another, entitled "Energy Measurements of Re-igniting A.C. Arcs," in the September issue of the *Journal of Applied Physics*. Eskin was formerly chief engineer of the American Thermometer Company, St. Louis, and research engineer of the Edison Electric Appliance Company, Chicago.

The Secretary attended the March dinner which the Technology Club of New York held in honor of Dr. Compton. The Class was imposingly represented, both in terms of numbers and distinction — the distinction deriving in part from the wives who were present and most agreeably and decoratively so. Surprise guest at this dinner was Edmund Bromilow, who, for most of his years since graduation, has been in Manila with the General Electric Company. He is now in New York, enjoying an interlude between his Manila experience and a yet unassigned new foreign post. — Mike Radoslovich, Earl Wheeler, Bill Latham, Wicks Eddy, Herbert Kaufmann, Hump Barry, and several other members of the Class were among those present. (If the Treasurer's memory were better, he could reel off the whole lot, for he saw and talked with them all.)

In order not to let the event be forgotten, let it again be recorded that next year we celebrate our fifteenth anniversary as a Class. At this point of adolescence classwise, we should plan to celebrate with the exuberance of adolescence, despite the graying hair, the resplendent dome, and the constantly expanding contours of obesity. — JAMES R. KILLIAN, JR., *General Secretary*, Room 3-208, M.I.T., Cambridge, Mass.

1927

Charlie Carr has dropped us a note that he is with the *Glass Industry*, 11 West 42d Street, New York City, and lives in Ridgewood, N.J. No other particulars from Charlie. — The Boston *Herald* of February 18 carried the announcement of the engagement of Miss Betsy Linscott to John Keary. Miss Linscott is a graduate of Dana Hall and Wheaton College. — Oscar Cox, who was formerly located in New York, is now in Washington, where he is assistant to the general counsel of the Treasury Department. — Ralph Carey is with Shell Oil Company, Inc., Jackson Heights, Long Island. — Professor Locke '96 sends word that Charlie Germain is now general mining foreman at the Pedro de Valdivia plant of the Lautaro Nitrate Company, Ltd.

A meeting of the '27 men in New York took place at the Technology Club on March 15, as announced in the March issue of The Review. There were seventeen of the Class present, and although considerable news was passed around, your Secretary unfortunately did not make notes at the time and thus must depend on his memory. Those attending for the first time were Morg Collins, Buckley, Wes Meytrott, and Schaad. Others present were Dodge, Davin, Melhado, Fisher, Staples, Mott, Bonnar, Hibbert, Sanborn, Woolfenden, True, Buhler, and

Lew Baker. Collins is with Lehman Brothers, lives in New Canaan, Conn., and has two children. Alan Beattie was unable to be with us, but Morg told us that Alan was presented with a son on last Christmas morning. Bud Fisher is with Standard Oil Development Company. Wes Meytrott is sales manager for the Consolidated Edison Company of New York, Inc., and is, I believe, particularly concerned with household appliances. Ed True announced that he was moving to Bath, Maine, to go into the drug business. We are sorry to have Ed leave the New York crowd but are glad to know of the swell setup that he has arranged.

We had asked Ernie Dodge to talk to us about radio and particularly the use of the telephone company's long lines in the intricate hookups that are used today. Being in the long-lines department of the American Telephone and Telegraph Company, Ernie is well versed on this subject. He outlined the history of the application of radio to the facilities of the telephone company and gave a talk that was very easily understood by all of us. It was extremely interesting and certainly proved the point that we don't have to seek outside talent to find speakers who can deliver effective talks on subjects that have a general appeal to the men who attend our gatherings. Not being Ernie's booking agent we feel free to tell you that he did a swell job.

Bob Bonnar has agreed to continue his responsibilities in the running of these New York dinners. It was decided to hold the next meeting in the fall; due publicity will be given it, so that all who want to attend will be able to arrange their plans accordingly. — RAYMOND F. HIBBERT, *General Secretary*, Care of Johns-Manville Corporation, 22 East 40th Street, New York, N.Y. DWIGHT C. ARNOLD, *Assistant Secretary*, Arnold-Copeland Company, Inc., 222 Summer Street, Boston, Mass.

1929

After letting the dead lines for publication in The Review go by the last few months without originating a few sentences of class interest, your Secretary is moved to wonder whether the lack of news has brought the realization that we have not heard from any of you for a very long time. Just a line or two would be appreciated.

Yours truly is still situated in Akron and still working in the development department of Goodyear. The last year, however, has seen some changes in the locations of other '29 men of whom your Secretary has written in years past. Hank Gibbons, II, has resigned from Goodyear Zeppelin and is now with Vought-Sikorsky division of United Aircraft in Stratford, Conn. Hal Dick, II, is no longer with Goodyear Zeppelin but is covering the western half of the United States for the aeronautical sales department of Goodyear, specializing in aircraft brakes and tires. When last heard from, Johnny Hartz, X, was a compounder in the development department of the Goodyear Tire and Rubber Com-

pany plant, in Gadsden, Ala., where he moved last summer after he was married to Marjorie Bierce of Tallmadge, Ohio. Gene Gilman, X, is no longer with Goodyear, but for the last year has been running an independent laboratory. Recently he announced plans to relocate in Rochester, N.Y. Ted Ewald is still with Goodyear, though I cannot tell you much more about him, for we have had considerable difficulty getting together because of his maintaining a permanent address in Cleveland where he spends his week ends.

Your Secretary's daughter, Alice, celebrated her second birthday on February 28, all of which was the big event of the late winter season in this household and serves well as a reminder of how rapidly time flies.

From the news clipping services we learn that Nicholas Alexander, II, of Rhode Island State College, has built up a fine course in aeronautics with the help of Igor Sikorsky who, as visiting lecturer, collaborates with Professor Alexander once a month.

Milton Male, IV-A, writes that he is still with the United States Steel Corporation. Unfortunately, his letter has gotten out of hand for the moment, and I'll have to apologize to him and write the rest later after investigating all our daughter's hideaways for the things she takes out of the desk. — Don't forget to stop off in Akron if you are traveling this way this summer. — EARL W. GLEN, *General Secretary*, Box 178, Fairlawn, Ohio.

1930

David Winslow Latham is four days old as these notes are written [March 25]! Jack Latham, II, is the proud dad, and David is the third of the younger Lathams, William (Nick) and Harriet having preceded him. — Another Course II man, Norm Smith, has been receiving congratulations, the reason for which is a young lad named William Smith, now four months old.

Our ten-year reunion will be held on Saturday and Sunday, June 1 and 2, at the Riversea Inn in Old Saybrook, Conn. This spot, midway between New York City and Boston on Long Island Sound, has excellent facilities for golf, tennis, and water sports. Other M.I.T. Classes have reunited there in recent years and enjoyed the location very much. Former members of 1930 who may be listed as members of the Classes of 1931 or 1932 and who may not have received application blanks for the reunion are urged to write to the Secretary if they are interested in attending. We hope to see a large delegation of 1930 men on Alumni Day, particularly since the swimming pool is to be dedicated on that day. Professor Anderson of the Institute's School of Architecture is one of the new building's designers, while Jack Jarosh is coach of the M.I.T. swimming team. Since both men are classmates of ours, they deserve our congratulations and presence on Alumni Day, June 3. — PARKER H. STARRATT, *General Secretary*, Bradley Park Drive, Hingham, Mass.

1933

The only news we have this month is the arrival of a daughter, Leal Hadden, on February 26 at the home of Mr. and Mrs. Hugh W. MacDonald, XIII. — Somebody must be doing something, so how about some news? — **GEORGE HENNING, JR.**, *General Secretary*, Belmont Smelting and Refining Works, Inc., 330 Belmont Avenue, Brooklyn, N.Y. **ROBERT M. KIMBALL**, *Assistant Secretary*, Room 3-102, M.I.T., Cambridge, Mass.

1934

At some time in our lives each of us has felt the desire to cast aside our daily routine and, with a toothbrush and an extra shirt, set off to explore some foreign land. Very few of us, however, have the courage actually to cut loose from our daily obligations and make such dreams reality, especially when all finances for the trip have to be made en route. Henry Lambert is doing just this. After finishing school, he and Mrs. Lambert started off on a world tour and are still traveling. Their first stop was at Mrs. Lambert's home in the Barbados, whence they went to New Zealand.

Their travels in New Zealand have been so well described in the *Georgian* by Mrs. Lambert's letter to her alma mater that I have made excerpts: "After nearly three years we are still here in New Zealand, enjoying the sleepy village of Taupo. The only excitement is an occasional earthquake and, of course, the local movies. . . . We hadn't planned to visit Taupo when we set off on the hike, with our three-months-old daughter on board the two-wheeled cart we had built out of a packing case. Together with our camping equipment and home-made little tent, we had a full load. . . . Miles of beautiful undulating pastures, checkered by gorse hedges and dotted with neat cottages, unrolled before us like the scenes out of a picture book. In the evenings we camped near friendly farm-houses under the watchful stare of curious cows. . . . Once we met a flock of three thousand sheep on their way to the stockyard, expertly convoyed by two mounted drovers and their dogs. We hiked southward through New Zealand's great thermal region, a rather desolate area. . . . Rotorua is noted for the famous mineral baths, the beautiful public gardens, and the nearby native village. At Waiotapu the Lady Knox geyser is made to play at ten o'clock each morning by throwing soap into it! Wairakei, with its baths, tennis courts, and golf course, is set in a pine girt valley. And finally, Taupo.

"A full month's walking had been enough. We stopped. This is one of the areas where the native Maoris are still fairly numerous, although, taking the country as a whole, they constitute less than one per cent of the population. . . . Here in Taupo was born our second daughter, whom we named Daphne Manutai, the latter a Maori name meaning 'sea bird.' . . . When we are well established in our new photographic pro-

fession we will be moving on, but in the meantime we are learning all we can about this prosperous country. . . ."

This is the kind of thing in which we are all interested. If any of you have had similar experiences, the Class would appreciate sharing them. — **JOHN G. CALLAN, JR.**, *General Secretary*, 184 Ames Street, Sharon, Mass. **ROBERT C. BECKER**, *Assistant Secretary*, Chile Copper Company, Chuquicamata, Chile, S.A.

1935

George Agnew is back in California after having spent a couple of years in Peru. — Bill Hawkes has left the navy air service and is now with American Airlines at the La Guardia Airport in New York. — Tzeng J. Suen is at the Vegetable Oil Cracking Plant in Chungking, China. — Irv Banquer went overboard on February 22 and married the former Miss Anni Bieringer of Brookline.

The most important news this month, however, concerns preliminary plans for commemorating (or forgetting) the fact that it's five years since we forsook the loafer's life at Tech (except Course XV, naturally). A committee consisting of Dick Lawrence, Stocky, Jim Notman, Dave McIntosh, and your Secretary have put their heads just close enough together to decide that we are going to invade the Mayflower Hotel at Manomet Point, Plymouth, Mass., on Saturday, June 1, to swap a few Limericks and whatever else we've learned about life since we moved out of reach of Wellesley. The married men will have plenty of chance to brag and to demonstrate their athletic superiority over the bachelors; it is also rumored that the ocean will not be the only liquid substance available. But why tell you what you already know? You're bound to have one of the best times of your lives. The total cost will be eleven dollars or less, including room, all meals, entertainment, beer, and transportation from Boston to Plymouth for those who need it. In case you've mislaid your letter from the committee, the registration fee is five dollars and should be sent to W. H. Stockmayer, Room 4-152, M.I.T., as soon as possible.

The reunion committee would be pleased to have suggestions about the program. One bit of advice has already come from our incomparable New Bedford politico, Duff. Still retaining the neat turn of phrase he displayed during our Beaver Oration, John counsels us to insure everything in Plymouth and to have a garrison of state troopers within earshot. It is not known whether or not Duff himself will appear with a New Bedford police bodyguard; we suspect, however, that he will have his collar on backward.

One other thing: Let's make the class survey as complete as we can. You who can't get to the reunion will want it all the more, so send your buck along right away! — **ROBERT J. GRANBERG**, *General Secretary*, Care of W. C. Voss, 9 Old Town Road, Wellesley Farms, Mass. **RICHARD LAWRENCE**, *Assistant Secretary*, 111 Waban Hill Road North, Chestnut Hill, Mass.

1937

William Austin has decided that the way is easier and brighter with two than alone; his engagement to Margaret Dolan of Hyde Park, Mass., was announced on February 6. Still another engagement is that of Roger Wingate and Ruth Turner of Melrose, Mass. — On March 15 the M.I.T. Club of Northern New Jersey sponsored a dinner and trip through the Museum of Science and Industry in New York. We enjoyed dancing during dinner, and Mrs. Johns won a free flying lesson. Incidentally, I saw not one other '37 man there. Where were you all?

The only other news comes from Ray Dreselly in Humble Dorms, Baytown, Texas. He works for the Humble Oil and Refining Company and says: "This may not be the letter that takes the prize for coming the longest distance, but it certainly is coming from one seldom heard from. I've been in the process of getting down to writing for so long that it hurts to try to remember that far back. There isn't much I can say about myself, but I can give you an item of interest on my ex-roomy, Mort Abbott. If you haven't already heard, Mort was married . . . to Miss Emily Morrell of Glassboro, N.J., his sweetheart these many moons. The lad is now burning up the highway between here and Houston, bent on purchasing furniture.

"I believe it was once reported in The Review that Mort and I were working here in technical service. That is still correct as far as I am concerned, but Abbott is now a process engineer. His work consists of the designing of new units here at Baytown and at the other company refineries. As for my business — I deal with the operating problems of the equipment we already have. It's a fascinating job because of the variety of problems we encounter. I am part of a group who work all over the refinery, covering not only all the phases of the oil industry but also the generation of utilities and the production and conservation of our water supply. I am absolutely amazed at the amount one doesn't know about the oil industry about two weeks after graduation. I really like the job, the company, and the people who work here. I'm gradually getting used to Texas, although I still gripe about the high price of cigarettes and gasoline.

"I hear occasionally from some of the boys. Comley is still with Crown Can in Philadelphia. When last heard from, Sabi was commuting from New York to Cuba in the interests of some sugar company. John Withers is seeing the world on behalf of the Standard Oil Development Company. Schneider is in the patent division of the Lumus Company, and Bill Harp is working for Humble at Ingleside. As the boys with Humble would say, 'That's the buzz from Baytown.' — Hope to have more next month, and I hope to see you at Alumni Day, June 3; I'm not sure I can be there, but others will be. — **WINTHROP A. JOHNS**, *General Secretary*, 245 Hale Street, New Brunswick, N.J.

1938

Bill Beye is still doing test work for Hamilton Standard Propellers in East Hartford, Conn., and is evidently doing all right as he now has an assistant. — Howie Milius is now spending his time in Bridgeton, N.J., with Seabrook Farms, manufacturing Birdseye frozen foods. — Don Mitchell is established in Dorchester, Mass., making bigger and better bars for the Walter Baker chocolate company. — Fred Hurley, who was married some time ago, is traveling for Crown Can as a sort of consultant for customers.

Nathan Einis is reported as being busy in a business of his own — reclaiming exposed x-ray films, selling the silver, and dyeing the celluloid support for sale to novelty manufacturers. — Ross Teel has recently shown up in Cambridge and is now in the purchasing division of Lever Brothers. — Dave Beaman is in Cambridge with Simplex Wire and Cable, where he is an assistant to the plant superintendent on maintenance work. At present he reports himself up to his neck in time studies, trying to effect a standard cost system for maintenance, but he finds time to relax once in a while and to sing a resounding bass with the Glee Club.

Paul Tillson is in New Jersey with the Standard Oil Development Company, and some time ago one of our correspondents ran across him here in Cambridge. At that time Paul was in the training course, and his particular duties for that period made him superintendent, foreman, and laborer in the emptying old barrels of oil department. — Newt Hammond, also in New Jersey, is reported as happily settled with his wife in Audubon. Rumor has it that the Hammonds have located in a "swell" house, where Newt has a workshop in the basement and spends all his nights at home.

Dick Muther, who, incidentally, has recently been appointed for another year as an assistant to Professor Schell '12, reports that he sees boys from our Class once in a while. Ros Cooper was one of these. Ros is working with a textile mill in Adams, Mass., and said that he occasionally had word from Ab Towers, who has some pretty wild tales of his experiences in western mines. Ab is back in New York City now. — Dick also writes that he and Don Severance, who was recently promoted to the position of assistant to the Registrar, went to the Sonja Henie show with Mr. and Mrs. Paul Black. The Blacks had come up from Connecticut, where Paul is connected with a lamp reflector company. — Fred Reuter has been appointed assistant to Professor Stockbarger '19 and will continue at the Institute for another year, doing research on the properties of crystalline matter. Fred has just completed his master's thesis.

Jim Gilliss writes that he's now in Kearny, N.J., working for the Federal Shipbuilding and Dry Dock Company. He began his activities by acquiring two desks and a beautiful (but married) secretary the first day he was at work, and

he's now busily engaged in outfitting several of Federal's new destroyers. — It is reported that "Deacon Roper and his charming wife are very cozily established in Riverside, Conn., where little Charles is living up to the dignity of his years and can already do multiplication on a slide rule."

Ken Gunkel drove to Boston recently and reported himself to be enjoying life with Babcock and Wilcox. He's now in the design section after having been through just about every other part of the company.

Your General Secretary has moved to the address noted below and is literally eating his heart out for news of his classmates to fill the new letter box. — DALE F. MORGAN, *General Secretary*, 55 Pennsylvania Avenue, Mount Vernon, N.Y. LLOYD BERGESON, *Assistant Secretary*, 885 Beacon Street, Newton Centre, Mass.

1939

To Bill Deering, II, we extend our sympathies, as he was forced to spend the greater part of the winter in the hospital. We hope that by now Bill is fully recovered and showing the mechanical engineering world how. From Bill's letter: "I'm getting a really good rest and catching up on all the good books ever written. Dick Walker, II-A, is likewise in my unfortunate condition and is about three miles away in another hospital. There is even a '21 man in here with me. We Tech boys sure do get around."

From Herb Finke: "Am working with United Aircraft and doing a good job of forgetting all the electrical engineering I ever learned. I'm specializing on the weight and balance of the airplane, and the more I learn about aeronautics, the more amazing it becomes to me that the contraptions actually do fly. Saw Carl Segerstrom a few days ago — he's employed at Salem by the Hygrade Sylvania Corporation and doing very well. Going in for ice skating and numerous other sports with appropriately high accident rates. P.S.: Bought a car, but it doesn't run"

From Norm Taylor: "I am with the Lombard Governor Corporation in Ashland, Mass., doing development work under Henry Warren ['94] of Warren Telechron fame. Have had considerable good fortune in getting a new type of electronic temperature recorder to show a good deal of promise in the last six months."

Paul Sokoloff writes: "Greetings from the Black River country, where the sun never shines and kid merc stays between 20 below and 15 above. My job is like that of any other beginner, i.e., doing all the jobs designed for trainees which others don't seem to have a hankering for. Fun, though, especially my present assignment of designing a multivibrator frequency meter, controlled by signals from WWV, the Bureau of Standards station."

From Burky Kleinhof, VI-C: "I don't know whether or not you're aware of the fact that me ole bosom pal, Pacini,

is not at Yale. It appears as though he turned down the offer at Yale, waited a while longer, and has finally wound up in Magnolia, Ark., with the National Geophysical Company or some such. As for my job with Electric Service Supplies Company, Philadelphia, it's in good order — the month in the sales department has passed and I'm now in the illuminating department. Here I'm working on transportation lighting fixtures as well as floodlighting projects . . . so I'm finally in engineering, the practical way this time."

And from Al White: "Well, I bought a car, so now all I need is that kilowatt on twenty. I'm now with the National Company, famous for their HRO and NC-100 receivers (plug); so perhaps the ether crusher will take form shortly."

In a letter from Joe Mazur, we learn of further Course VI activities: Gordon Andrew has been working since July for the Howell Electric Motors Company in Howell, Mich., enjoying not only the work but, likewise, the corn-fed and other natural beauties. Quoting Gordon: "Web Tileston is tearing up and down the Hudson Valley, doing relay testing for the Central Hudson Gas and Electric Company. Yurgie Yurgelun is connected with the New England Power Company — at present in Amesbury, Mass., while Pat Bowser of VI-A is Instituting for his M.S." Since the middle of July, Don Gleason has been working as a student engineer for the Narragansett Electric Company at Providence.

Mac MacMillan fulfills his Christmas card promise to write with news of the Pittsburgh Westinghouse plant. "Keep Waste Away and Raise Your Pay" (with apologies) seems to have become his slogan. Mac says: "My first assignment in the Westinghouse training course was at the New York World's Fair — three supreme months in Grover's playground — receiving, entertaining, and . . . educating . . . the guests. . . ."

Charlie Wang is working for his master's degree at the Institute's Graduate School, breaking the monotony with an occasional soiree to New York. — Sam Hutchins, working for the Long Island Lighting Company in Mineola, exclaims about Times Square: "About the first of December, I was strolling up Broadway and Millard Cohen, now Brenner . . . with love interest attached . . . tapped me on the shoulder! . . ."

Jack Detlefson, II, writes: "For excitement I am struggling with a Ford — to keep it going well enough to get to work and return. Results so far are encouraging but uncertain. As for a job, your correspondent is employed by the Du Pont company in the industrial engineering division, working on cost-improvement studies on current processes and equipment. You'd be surprised how little essential difference there is between industrial and chemical engineering." — STUART PAIGE, *General Secretary*, Box 207, Greenwich, Conn. MORRIS E. NICHOLSON, *Assistant Secretary*, M.I.T. Graduate House, Cambridge, Mass.



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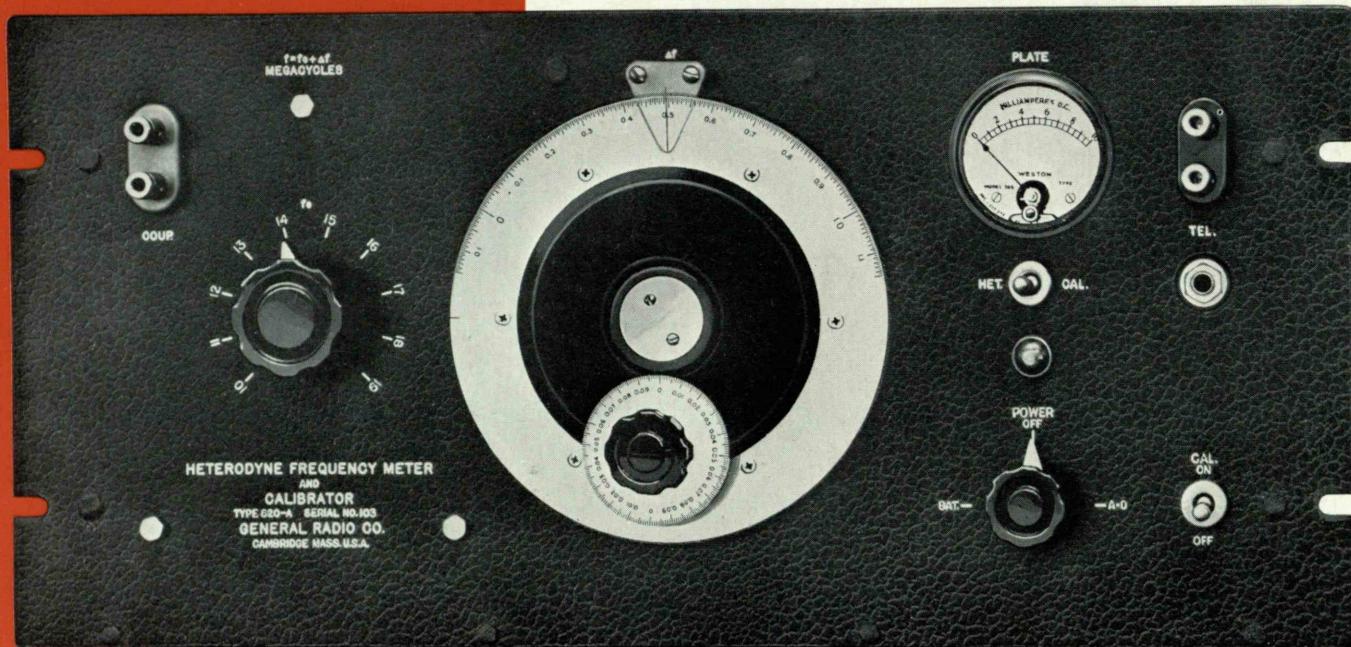
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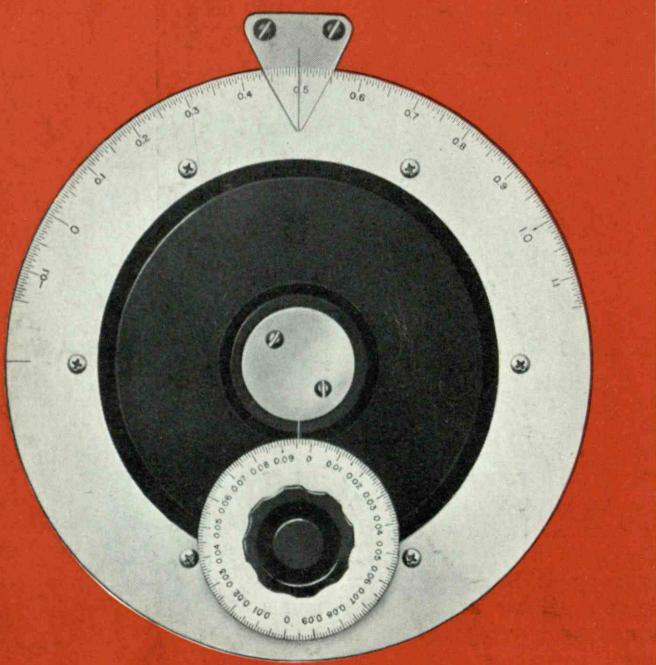
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